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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

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ORIGINAL MEMOIRS.

ON PRESERVATION OF THE NERVE SUPPLY TO THE BROW, IN THE OPERATIVE APPROACH TO THE GASSERIAN GANGLION.

BY HARVEY CUSHING, M.D.,

OF BALTIMORE.

JUDGING from the photographs that have accompanied the reports of cases operated upon by others, as well as from my own experience with the ganglion operation, an almost inevitable effect of the incision, as it is usually made, is a paralysis of the occipitofrontalis muscle (*pars frontalis*) due to the severance of the upper twig of the facial nerve. This highest branch of the "*Pes anserinus*" after crossing the zygoma on its way to the brow takes its course through the subcutaneous tissue overlying the temporal fossa, and thus traverses the direct field of approach to the ganglion. Just below and in front of it lies a separate branch destined to innervate the orbicularis, and some of the proposed methods of approaching the intracranial field of operation must necessarily sacrifice both of these upper twigs of the facial, and so lead not only to the deformity under discussion, but to impairment of the palpebral sphincter as well,—a matter of no small moment. It is

exceptional, however,—though the accident has been known to occur,—for the lower of these nerves to be injured either by the Hartley-Krause procedure or by the modification of their method which I have favored. Section of the upper twig, on the other hand, can hardly be avoided in making the usual horseshoe-shaped incision so commonly employed. Heretofore, so far as I am aware, no effort has been made to preserve this nerve; the operation in itself being considered so serious a one that such a trifling postoperative palsy as results from its division has hardly seemed deserving of attention. The deformity is not an obtrusive one, only showing when there is an effort to raise the eyebrows, or in old people by a planing out of the transverse folds of the brow on the side of the neurectomy (Fig. 1). Nevertheless, as an operation develops, it is well to improve its technique even in the smallest details, and a modification of any operative procedure which can, even in slight degree, improve its cosmetic result, is most desirable, and this is especially so when a palsy of the expressional musculature is concerned.

In a recently printed paper dealing with this operation,* comment was made upon this slight paralysis, and the opinion was expressed that an effort to save this small nerve would so further complicate an already complicated operation that the attempt would be injudicious. It was also noted that in a few of the cases of my series there had been a partial restoration of the power to elevate the brow, due, it was presumed, to the painstakingly exact approximation of all the divided tissues at the time the wound was closed. For, if unnecessary scar formation or the interposition of other tissue does not prevent, there is a natural tendency on the part of severed peripheral nerves to reunite and to re-establish connection with their old terminals. In the case, however, of such a long and delicate nerve as that under discussion, this good fortune can rarely be expected.

* "The Surgical Aspects of Major Neuralgia of the Trigeminal Nerve." Journal of the American Medical Association, March–April, 1905.

FIG. 1.—Photograph of a patient in whom the highest branch of the facial on the left side has been divided, as in the usual temporal incision; to show the deformity under discussion. Note the sagging of the brow on the left side and absence of frontal wrinkles during the effort to look upward.

FIG. 2.—To show line of incision. Photograph taken on fifth day after operation. All sutures were removed on the second day, except the most anterior one: as scar was almost invisible this one was left to delimit anterior end of incision in photograph. No drainage used.

FIG. 3.—Postoperative areas of anæsthesia; total within inner line. Scars of earlier peripheral operation observable under eye and angle of jaw.

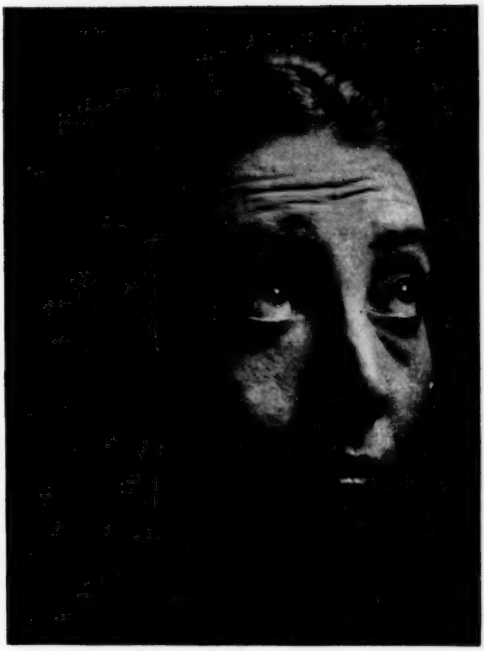

FIG. 4.—Two weeks after operation. Almost total restoration of movement of occipito-frontalis, temporarily paralyzed in this case.

FIG. 5.—Photograph of tissues removed; showing intracranial portion of the fifth nerve intact. Slightly reduced in size. Under surface of ganglion.

In my last five operations I have again turned my attention to the question of preserving this nerve, and have found, contrary to my expectations, that the incision and approach to the skull could be so altered as to avoid injuring it without adding particular difficulties to or modifying in any great respect the subsequent steps of the operation. Four of these cases have been total extirpations for major neuralgia; in the fifth I had to be satisfied with simple division of the sensory root of the trigeminus,—a case in which an inoperable sarcoma had grown up through the base of the skull under the ganglion, causing severe trigeminal pain. The malignant nature of the disease from which this patient was suffering rendered the question of cosmetic result far less important than in the neuralgia cases, and consequently the zygomatic arch was not removed, but in other respects the method of approaching the ganglion has been the same in each of the five cases.

The situation of the incision can be seen by consulting the accompanying photographs of one of the patients. It has been made within the hair margin, not for the purpose of concealing the scar, because these cicatrices are almost invisible after the operation, but, as has been stated, in order to avoid division of the nerve. The posterior limb of the incision is carried down to the zygoma over the temporal vessels, which usually must be ligated. The skin flap is then reflected downward and forward by blunt dissection, the handle of the scalpel sufficing for this purpose. The temporal fascia, thus exposed, is incised in a line concentric with the skin incision and likewise reflected. The zygoma, which has thus been brought into view at the lower angle of the wound, is then shelled out of its periosteal sheath, not as formerly described by making an incision along its external surface, but by crowding forward its coverings en masse. The exposed fibres of the temporal may then be divided as usual by a horseshoe-shaped incision, and the muscle scraped away with a periosteal elevator as far down as the base of the skull. In order to satisfactorily expose the skull, a little deeper retraction of the flap is necessary than by the older method, the ordinary small appendix retractor

being used for the purpose of holding down the cutaneous and fascial part of the flap as well as the muscle. From this point on the operation is conducted as heretofore described.

In the first of these cases, when the skin flap had been retracted, the nerve to the brow was exposed, and, though efforts were made to preserve it, it doubtless suffered injury through stretching during the downward retraction of the flap in the subsequent stages of the ganglion extirpation. Immediately after the operation it was found that the customary inability to elevate the brow was present; but the paralysis was of short duration, and before the patient was discharged from the hospital two weeks later, it had so far recovered that almost a symmetrical wrinkling of the two sides of the forehead was possible (Fig. 3).

In the other four patients even this temporary palsy of the nerve was avoided, and the cases are so much alike that it is needless to give more than this one series of photographs to show the situation of the incision, which did not interfere with subsequent innervation of the occipitofrontalis, and at the same time allowed sufficient access to the ganglion to insure a total extirpation.

THE OPERATIVE TREATMENT OF CLEFT PALATE.[1]

WITH A REPORT OF EIGHT CASES.

BY CHARLES H. PECK, M.D.,

OF NEW YORK,

Attending Surgeon to the French Hospital; Assistant Attending Surgeon to Roosevelt Hospital; Instructor in Surgery, Columbia University.

THE relative merit of the operative treatment of cleft palate as compared to the treatment with dental obturators, has long been a matter of dispute. It is not my purpose to enter into a discussion of this aspect of the subject, as my cases are too recent to exhibit final results as to improvement in speech, but rather to call attention to certain points in technique which aid in securing prompt surgical closure of the cleft with a minimum amount of damage to the muscles of the soft palate, so important an element in securing proper enunciation.

The Time to Operate.—Children six or seven years of age are, I believe, the most favorable subjects for operation from the purely surgical standpoint. The mouth is sufficiently large; the loss of blood and shock make little impression on a child of this age; the patients are old enough to give intelligent assistance in the after-treatment and to be taught to wear the protective dental plate to be described later. The very serious disadvantage is that habits of speech are already formed and the defect in pronunciation is undoubtedly more difficult to overcome. Whether we can expect enough gain in this respect, in operations performed at three years of age and under, to counterbalance the increased danger from shock and hemorrhage, the greater difficulty of technique due to the small size of the mouth and the delicacy of the flaps, and the fact that the patient is unable to give any intelligent assistance in the after-treatment, I am as yet unable to determine, as my

[1] Read before the New York Surgical Society, October 25, 1905.

experience in operating at this age is too limited and recent. With the operation in early infancy, ten days to three months of age, I have had no experience. Results in the hands of surgeons other than the originator of the method have certainly not been encouraging and a high rate of mortality is admitted. I have heard of no completely successful case operated upon in this city, and the published reports of the method which I have been able to find have been too vague and void of detail to afford any basis of comparison in regard to actual results.

Anæsthetic, Position and Gag.—I have invariably used the hanging head, Rose position, intermittent ether anæsthesia with an open cone, and the Whitehead gag. I have never resorted to preliminary tracheotomy and do not believe that it should ever be necessary. In adjusting the tongue piece of the gag the tongue should be drawn well forward and to one side with a traction suture passed through its tip (see Fig. 1). If this is not done, as the tongue piece locks the base of the tongue is forced over the entrance to the larynx and breathing is interfered with. After the gag is in place the operator assures himself that breathing is unobstructed and regular before proceeding with the operation; if properly adjusted the gag need not be touched again until the operation is completed. The operator stands at the head of the patient, facing the feet, looking down on the palate from above. Blood and mucus collect in the naso-pharynx, which is easily kept clean by frequent sponging, and little if any blood should get into trachea or œsophagus.

Instruments.—The special instruments used are the Whitehead mouth gag (Fig 1); a very slender knife for transfixing the edge of the flap, paring and splitting the edge of the uvula (see Fig. 2; I have used a cataract knife); a long slender pair of mouse-tooth forceps (Fig. 4); a strong, straight scalpel for making the lateral incisions; a thin, blunt periosteal elevator, slightly curved on the flat; a sharply curved Deschamp's handle needle (Fig. 8, *a*) for passing the heavier sutures; the author's special needle-holder and needles for the

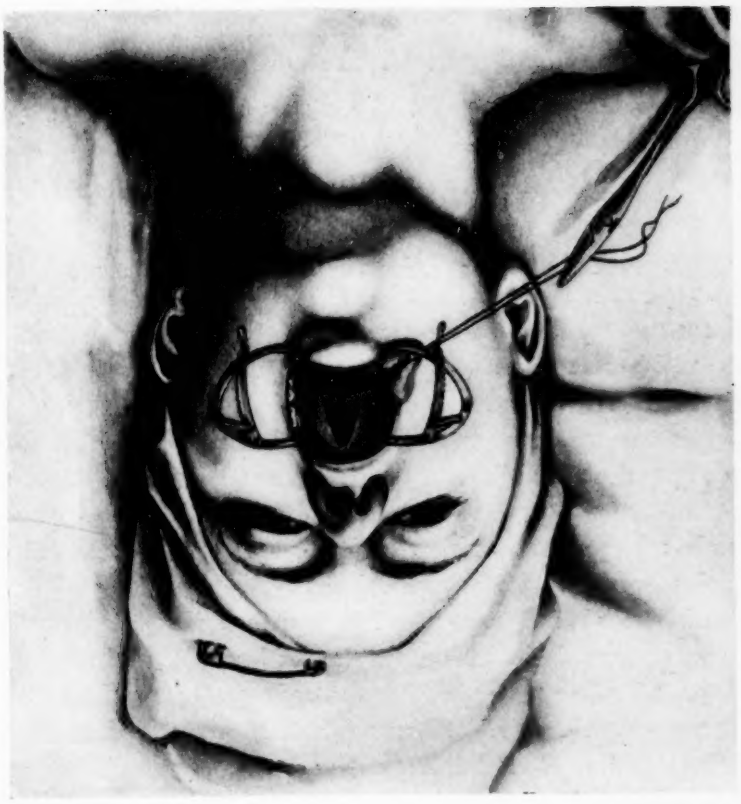

FIG. 1.—Head in Rose position; Whitehead gag in place with tongue drawn well forward and to one side.

FIG. 2 —Paring the edges of cleft; the strip removed is very narrow and should terminate at base of uvula, the border of which is split; this is not shown in the drawing.

fine sutures (Fig. 8, *b, c,* and *d*). This special needle-holder is rather an adjustable handle than a needle-holder proper, and was designed with the assistance of W. F. Ford & Co., to enable the use of the very finest needles, made with an eye in the point, in order to secure accurate apposition without damaging the delicate edges of the flaps. The protective dental plates used in Cases VI and VII, first suggested I believe by Dr. Porter, of Boston, were made from casts of the mouth taken before operation, by Dr. Fiaschi. They keep the tongue off the suture line and are a valuable aid in the after-treatment. Children are easily taught to insert and remove the plate themselves without disturbing the flaps. Fig. 8, *e,* is a drawing of the plate used in Case VI.

The Operation.—The edges are pared by transfixing the edge of the soft palate with a very fine, sharp knife and cutting first forward to the anterior angle of the cleft, then backward, bringing the knife out at the base of the uvula; the strip removed should be as narrow as possible to avoid waste of tissue, but the full thickness of the flap. (Fig. 2.) The mucous membrane of the uvula is then split on its inner border, *i.e.* facing the cleft; it easily separates to give a sufficient raw surface and all of the tissue of the rudimentary half of the uvula is saved. This I believe to be an important modification of the method which I formerly employed, of removing a strip of tissue clear to the tip. The denudation is repeated on the opposite side of the cleft.

The lateral incisions are now made, commencing opposite the last molar tooth close to the border of the gums and carried forward to a point opposite the anterior extremity of the cleft, but taking great care to leave a broad anterior pedicle to the flap, for nutrition. This incision falls external to the posterior palatine foramen and the main trunk of the artery as it runs forward; branches are first divided, the main trunk being usually torn by the periosteal elevator. In clefts running forward through the alveolar process I prefer to leave the extreme anterior end of the cleft for later closure, rather than endanger the nutrition of the flaps by prolongation of the lateral incision

and narrowing of the pedicle. Cases IV and VIII illustrate this condition.

Hemorrhage is free but soon stops spontaneously or with pressure applied with gauze pads on holders while the anæsthetic is resumed.

The curved periosteal elevator is then inserted in the lateral incision, and hugging the bone, is forced carefully through into the cleft; by lateral sweeps the entire flap is quickly separated, including the muco-periosteum at the anterior angle of incomplete clefts. Posteriorly the instrument is strongly carried outward and backward (Fig. 3) along the posterior margin of the hard palate, and to a great extent detaches the palatine aponeurosis and the mucous membrane on the nasal aspect of the velum from the bone. In the majority of cases hemorrhage soon ceases to be troublesome after this blunt separation: posterior branches of the descending palatine artery remain uninjured for nutrition of the posterior portion of the flap, even after very free separation with the raspatory. The inner edge of the flap is then seized with mouse-teeth forceps at the base of the soft palate, *i.e.* where the muscular pull concentrates (Fig. 4; the forceps are shown grasping the flap too far forward); a thin, straight bistoury is inserted through the posterior part of the lateral incision, and cutting outward and backward as traction on the flap is made toward the median line, the detachment of nasal mucous membrane and palatine aponeurosis from the posterior border of the hard palate is completed, and by a careful sawing motion enough of the mucous membrane of the naso-pharynx divided to allow the edges of the flap to fall to the median line without tension. Few if any of the fibres of the bellies of the levator or tensor palati are cut.

The palatine aponeurosis which receives the insertions of the tensor and levator, is completely detached from the posterior border of the hard palate as far outward as the base of the hamular process, together with the mucous membrane on the nasal aspect of the soft palate, allowing the velum to drop downward. This aponeurosis with its muscular insertions

FIG. 3.—Elevating the muco-periosteal flap; the lateral incisions have been made; the elevator is inserted through lateral incision

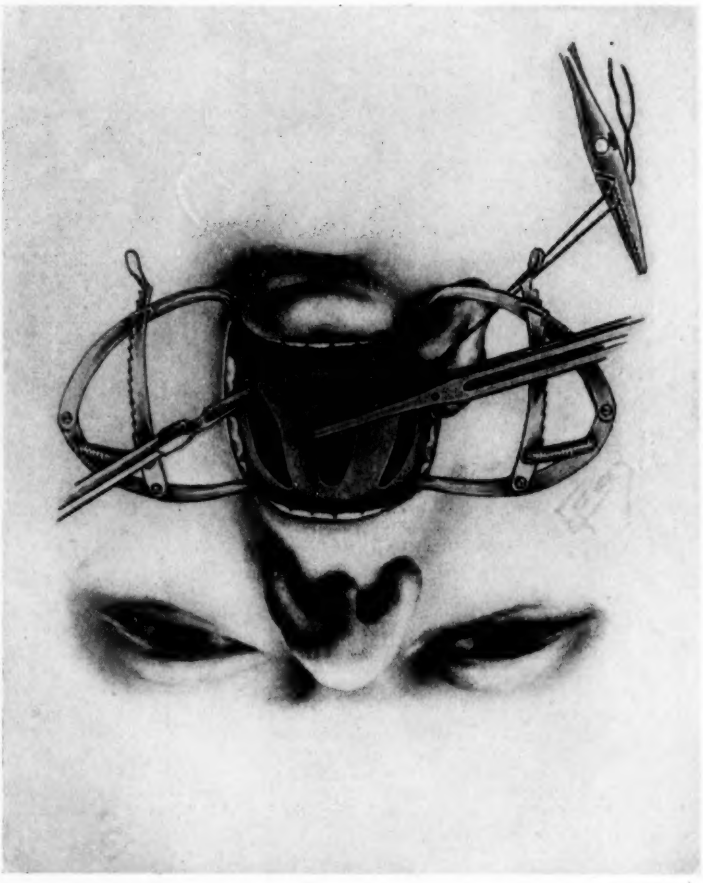

FIG. 4.—Relieving tension by dividing palatine aponeurosis and mucous membrane on nasal aspect at posterior border of hard palate; bistoury inserted through lateral incision cuts outward and backward; forceps shown grasping flap too far forward.

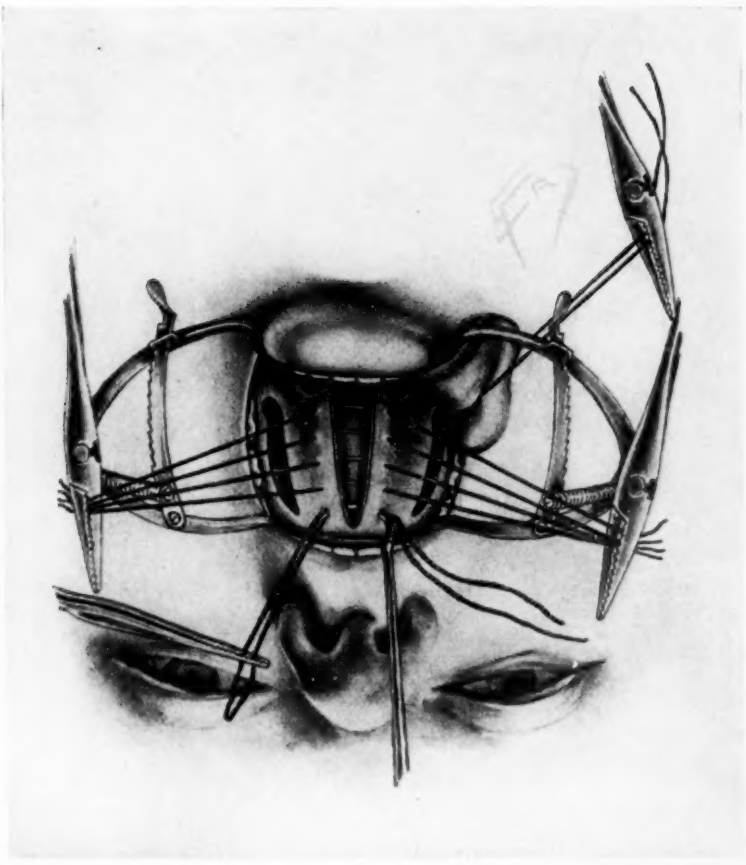

FIG. 5.—Four of the heavy sutures passed and ends secured; the fifth is being passed with the Deschamp needle, the loop grasped with thumb forceps as the needle is withdrawn.

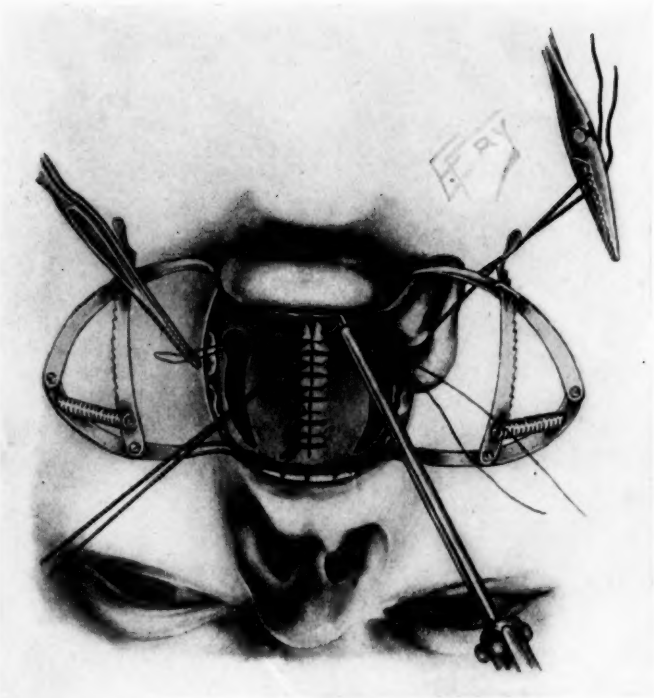

FIG. 6.—The heavy sutures have all been tied; the intermediate stitches have been passed and tied except the last one at tip of uvula, which is being passed with the fine special needle; the end of the last heavy suture is left long for traction during suture of uvula.

remains in the flaps. In cases of wide cleft, tension on the flaps is still caused by the shortened salpingo-palatine fold of mucous membrane running upward and backward on the lateral wall of the pharynx along the belly of the levator palati. Free division of this fold by gently tearing with the finger or snipping with blunt curved scissors as traction is made on the flap downward and inward to make it prominent, is easily accomplished without damaging the muscles, and effectually relieves tension. All this can be done without unduly narrowing the bridge of tissue behind, or endangering the nutrition of the flap.

By this time the hemorrhage has nearly ceased and the flaps are ready for suture. Beginning close to the base of the uvula, sutures of iron-dyed silk No. 6 are passed on the Deschamp's-handle needle through the entire thickness of both flaps at a sufficient distance from the edge to guard against cutting through; these are left untied until the last is passed, four or five being usually sufficient, placed one-fourth to one-third inch apart. They are then tied in order, with a surgeon's knot, usually beginning with the posterior stitch, the ends being left long for the time. Intermediate stitches of iron-dyed silk No. 3 are then placed between each of the heavier stitches, and two or three in the uvula itself, the last at its tip or even on the nasal aspect. They are passed on the very fine special needles with eye in the point, carried on the special needle-holder; they include only part of the thickness of the flap, are closer to the edge, are tied immediately and insure accurate apposition of the edges, such as is aimed at in all fine plastic work. Five to seven of these are used, making in all ten or twelve sutures (Fig. 6). The long ends of the heavier sutures are used for traction and steadying the flaps during the passage of the fine sutures, especially in bringing the uvula forward (Fig. 6). Each, as it has served its purpose, is cut short.

The operation is now completed except for the treatment of the lateral incisions. Formerly I packed these with a strip of sterile gauze, bringing the end out at the angle of the mouth and attaching it to the cheek with adhesive plaster. In my last

two cases I have used a device suggested by C. H. Mayo: a piece of white tape is passed around both flaps through the lateral incisions, drawn just tight enough to approximate the flaps slightly and guard against tension, and secured by a silk ligature. The ends are cut short and slid around to the nasal surface of the flaps (Fig. 7). This is left in place seven days and serves for drainage as well as the relief of tension; I have been much pleased with its effect in the two cases mentioned.

The time required for the entire operation is about one hour, ranging from 55 to 65 minutes in six of my eight cases. One case was completed in 45 minutes and one took two hours. In none of my cases has the hemorrhage been at all alarming, nor has serious shock occurred.

After-Treatment.—I have made this very simple. Sterile water is given by mouth with a spoon after the first twelve hours; feeding with sterilized milk, given in the same way at frequent intervals, is commenced at the end of 24 hours, and the quantity increased rapidly to full milk diet. I have never resorted to rectal feeding and none of my patients has suffered seriously from lack of nutrition. The lips, teeth and tongue are kept clean with boric acid solution, but no attempt is made to cleanse the palate or nasal fossæ. I prefer to trust to the primary adhesion and disturb it as little as possible.

The use of the protective dental plate made by Dr. Fiaschi protects the suture line from the tongue, especially in the act of swallowing, and is of great value when the patient is old enough to allow its use. It should be removed every three or four hours, cleansed in boric acid solution and replaced, preferably by the patient himself. I first saw it used by Dr. J. A. Blake. Both of the cases in which I used it healed by primary union throughout, one of them having been operated upon three weeks before with total failure of union.

When packing is employed in the lateral incisions it is removed on the fifth or sixth day and usually not replaced. In the two cases in which I have employed the tape I have removed it on the seventh day. Stitches are usually removed on the ninth or tenth day. Many of the small defects which

FIG. 7.—The tape has been passed through the lateral incisions around both flaps; the ends, fastened with a silk ligature and cut short, have been slid around to the nasal surface of the flaps.

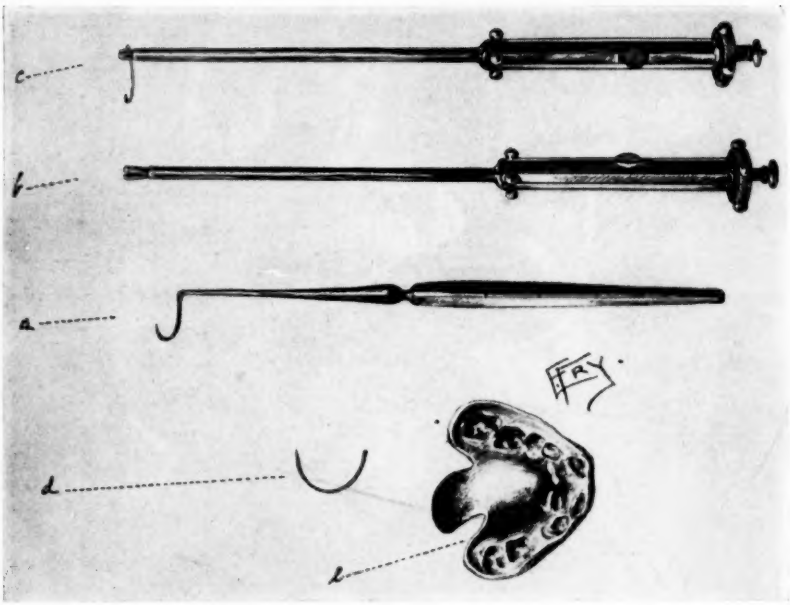

FIG. 8.—*a* right angled, halt circle curved, Deschamp's handle needle with Hagedorn point; *b* author's special needle holder, open; *c* Author's special needle holder with needle in place; it is held very firmly; *d* special needle with eye in point; made very fine; half circle curved; surgeon's point; *e* Protective dental plate made by Dr. Fiaschi for Case VI; fits over upper teeth and gums and is held by suction; tail piece to protect soft palate and uvula

so frequently occur at the junction of the hard and soft palate will heal by granulation in two or three weeks; persistent ones or defects in the uvula are closed by secondary suture.

CASE I.—Male, nineteen years of age; lumberman. Operated upon at Roosevelt Hospital, service of Dr. R. F. Weir, February 16, 1904, for complete cleft of soft and hard palate extending forward to incisor teeth. Cleft wide, arch high, no previous operation; right unilateral harelip. Palate operated upon in the usual way; lateral incisions packed with sterile gauze; no protective plate used.

Plastic on harelip performed at same sitting; time of operation two hours; intermittent ether anæsthesia used. Healing complete by primary union except for a small defect at junction of hard and soft palates which closed by granulation in a few weeks. Left hospital on March 1, 1904. Examined May 1, 1904: defect above mentioned entirely closed but another very small opening had appeared at anterior extremity of cleft. Improvement in speech very slight. Case not seen since May 1, 1904.

CASE II.—Male, ten years of age; schoolboy. Operated upon at Roosevelt Hospital, service of Dr. R. F. Weir, April 9, 1904, for complete cleft of soft and about two-thirds of hard palate. Usual operation performed; time of operation sixty-five minutes.

Complete healing by primary union with no defects; stitches removed on ninth day; no protective plate used. Left hospital April 20, 1904.

Examined October 18, 1905; no defects; soft palate moves freely; improvement in speech only fair.

CASE III.—Male, four years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, July 19, 1904, for complete cleft of soft and about two-thirds of hard palate. Usual operation performed; time of operation 60 minutes; no protective plate used. About the third day after operation child put finger in mouth and broke suture line in anterior portion of hard palate. Another small defect occurred at junction of hard and soft palates, the remainder of the suture line healing by first intention.

An attempt was made to close defects by secondary suture on July 31, 1904, with only partial success, but at time of dis-

charge from hospital, August 2, 1904, both defects were very small.

Patient had not begun to talk prior to operation: he was examined October 18, 1905; he is learning to talk and makes himself easily understood, his parents say, and pronounces many words very well indeed.

CASE IV.—Male, twenty-one years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, July 27, 1904, for very wide, complete cleft of hard and soft palates, extending forward through alveolar process. Harelip had been successfully closed in infancy. The usual operation was performed, no attempt being made to close the extreme anterior end of defect on account of danger to nutrition of flaps. Complete healing by primary union except for a small defect at junction of hard and soft palates which closed by granulation in about four weeks. Left hospital on August 2, 1904, but reported at intervals for several weeks; he failed to return for operation to complete closure of anterior portion of cleft. When last seen improvement in speech was not very marked.

CASE V.—Female, six years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, March 29, 1905, for complete cleft of soft palate extending about three-fourths inch into hard palate. A large adenoid was removed from the nasopharynx, and the usual operation for cleft palate performed; total time of operation 45 minutes. Healing complete by primary union except uvula, which separated and was closed by secondary suture May 31, 1905, healing promptly. No protective plate used.

Examined October 18, 1905; palate perfect except that uvula is diminutive; improvement in speech very marked; pronounces many words perfectly, defect in enunciation seeming hardly more than a lisp.

CASE VI.—Male, seven years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, May 13, 1905, for complete cleft of soft palate extending forward into hard palate about three-fourths inch. Operation performed three weeks ago by another surgeon resulted in complete failure of union. The usual operation performed; time of operation sixty-five minutes. Protective plate made by Dr. Fiaschi used in after-treatment; complete healing by primary union with no defects; stitches removed on the ninth day. Left hospital able

to insert and remove plate himself for cleansing, without touching suture line. Examined October 18, 1905; palate perfect except that uvula, as in Case V, was small, owing partly to the fact that in each the uvula was operated upon a second time. Improvement in speech only fair.

CASE VII.—Male, seven years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, September 22, 1905, for wide cleft of soft palate extending forward to middle of hard palate. Adenoids were operated upon nine days before. The usual operation performed; time of operation fifty-eight minutes. The tape around the flaps was used instead of packing in the lateral incisions; the Fiaschi protective plate was used in the after-treatment. Complete healing by primary union with no defects; stitches removed on the ninth day. Left hospital seven days after operation because he developed chicken-pox.

Improvement in speech is slight as yet.

CASE VIII.—Female, two years five months of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, October 12, 1905, for complete cleft of soft and hard palate, extending forward through the alveolar process. Harelip had been closed in early infancy. The usual operation performed, no attempt being made to close the extreme anterior end of the cleft on account of danger to the nutrition of the flaps. Time of operation fifty-five minutes. Tape around flaps instead of packing; no protective plate used as child was too young. Healing of the greater portion of the suture line, the uvula and one stitch in front giving way. Secondary operation will be performed in a few weeks.

The child has not learned to talk as yet, and should prove a good subject in which to study the effect of the operation performed at this early age. A sharp bronchitis complicated the first few days of convalescence.

Summary.—Of the eight cases, three healed primarily with no defects (Cases II, VI, and VII); one after a secondary suture of the uvula (Case V); one is completely healed except for a small anterior defect purposely left to preserve nutrition of flaps (Case IV); two have very slight defects barely admitting a probe (Cases I and III); and one, the most recent, has a defect of the uvula and also an anterior defect purposely left, both of which I hope to close by secondary operation within a few weeks (Case VIII). All of the defects mentioned in Cases I, III, IV and VIII could be easily

closed by secondary operation if it were possible to follow the cases and get them to consent to such procedure, as I hope to do in Cases IV and VIII.

The time spent in the hospital after operation in Cases I to VIII respectively, was 19, 11, 14, 6, 30, 7, 13, and 13 days. None of the cases suffered to any extent from shock or hemorrhage; two had rather sharp bronchitis following the operation, which soon subsided; all were fed by mouth after the first 24 hours. Intermittent ether anæsthesia, with an open, sterile cone was used in all the cases; the time of operation varied from forty-five minutes to two hours, usually fifty-five to sixty-five minutes, a considerable portion of this time being consumed in arresting hemorrhage and renewing anæsthesia. The only suture material employed has been fine iron-dyed silk, No. 6 and No. 3.

Conclusions.—The operation as described is essentially the operation of Langenbeck, and is capable of closing the cleft, if properly carried out, in nearly if not quite all cases of cleft palate, either in children or adults.

The easiest age to operate is from six to ten years, the best age probably from two to three years if it can be demonstrated that the danger is not too great.

The Rose position and the use of the Whitehead gag add greatly to the ease of exposure and control of hemorrhage.

The bellies of levator and tensor palati with their insertions into the palatine aponeurosis, should be preserved, but the attachment of the aponeurosis to the posterior margin of hard palate must be divided, together with the mucous membrane on the nasal aspect of the velum.

Complete relief of tension is essential, and division of the salpingo-palatine fold of mucous membrane is important to secure this.

Suturing should be as carefully done as in any fine plastic operation, and with needles that are sufficiently delicate to avoid injury to the edges of the flaps.

The after-treatment should be simple; no cleansing should be attempted on the palate or in the nasal fossæ; feeding by mouth should be commenced at the end of twenty-four hours. The use of the protective plate is of great value in older children and adults.

ACUTE ŒDEMA OF THE LUNGS SECONDARY TO ETHER NARCOSIS.

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THE subject of acute conditions of the respiratory and of the circulatory system during and after anæsthesia of any form is of great importance. The possibility of primary cardiac failure under chloroform is well established as one immediate danger of this anæsthetic. The sequelæ of ether are more likely to be of the secondary type, and to localize in the lungs, usually as lobular pneumonia and infrequently as lobar pneumonia, or in the kidneys, as the various forms of congestion and inflammation. Acute œdema of the lungs is one of the immediate sequelæ of ether narcosis, which, while undoubtedly comparatively rare, must fully be reckoned with.

The following case of it will be of considerable interest on account of the rapidity of its onset, of its long continuation, and of the total recovery of the patient without any after-effects whatever. The case likewise illustrates the extreme importance of examination of the chest in any case of cyanosis, which does not improve when the ordinary precautions and means of restoration of freedom of the upper air-passages have been taken, such as pushing the jaw and pulling the tongue forward and exploring the upper air-passages with the finger. It is in every probability certain that, if the chest of this patient had not been examined instantly with the ear, the œdema would not have been discovered sufficiently early to have rendered medical aid of service.

The incident occurred in the practice of Dr. Charles H. Chetwood, with whose permission and knowledge these notes are published, and whose favor and courtesy therein are hereby acknowledged.

Very full details of the case are given, because absence

of many factors in the cases reported in literature makes some of their notices rather unsatisfactory, as the second part of this paper will indicate.

For convenience of reference in the summary with which this paper closes, this case is called Case XV.

History and Examination previous to inducing Anæsthesia.—May 24, 1903; M. H., male; white; about thirty years old; American Jew; merchant; no previous operation under general anæsthetics; addicted to the moderate use of alcohol, such as the member of a wealthy family would employ socially; about five feet seven inches tall; weighs 120 pounds; of reasonable muscular development; of fair nutrition, although somewhat anæmic; of pale to sallow complexion; hair very dark, and general health good; of rather neurotic temperament; showed considerable fear prior to the operation, although able to enter the operating-room, and, unaided, to get upon the operating table. Examination of his heart and lungs by *cursory* auscultation over the front and sides of the chest revealed nothing abnormal. The back of the chest was not examined. The heart-beat was about 100 and quite normal in character. The arteries and veins were without feature, and the nose and throat had not been giving symptoms. No cough was present. Both stomach and rectum were empty. The ante-operative urine was normal. No visceral lesions were known to the operator. The pathologic condition was internal and external piles. The patient received no drugs prior to administration of the anæsthetic, which was the nitrous oxide gas and ether sequence with the Bennett inhaler. The posture was dorsal until the anæsthesia was complete, when the lithotomy position was used.

Induction of Anæsthesia.—About one gallon of gas was employed, that is, the ordinary gas-bag of the Bennett inhaler was filled to distention. Under this anæsthetic the patient became somewhat blue and did not show a full degree of its effect, as was proved by the fact that he underwent considerable ether excitement prior to finally getting under. This excitement was so great that restraint was necessary to prevent the patient from writhing off the table. The writer rarely has seen, except in hospital practice among alcoholics, an individual show as much

ether excitement as this man did. After the conjunctival reflex had been abolished, and after the pupils had dilated somewhat, although still reacting to light, the man showed great rigidity of the extensors of the extremities, especially at the knees and elbows. In the effort to overcome this rather obstinate muscular reaction, the anæsthetic was pushed rather hard and fast, and succeeded finally in eliminating the trouble after probably ten minutes' delay, which shows that no undue haste was present. The operation was begun at this stage.

Maintenance of and Condition during Anæsthesia.—The patient, however, did not stay thoroughly under the anæsthetic, in that he showed muscular movements during the operation, insufficiently, however, to interfere with the operator. His color throughout the operation was satisfactory; the pupils were moderately dilated but reacted to light; his pulse was steady at about 90 and his respiration showed the usual ether acceleration. There was throughout the anæsthetization hardly any mucus in the mouth or throat and no audible bronchorrhœa. The operation itself lasted about twenty minutes, and the man was inhaling the anæsthetics about thirty minutes.

The total amount of ether used in the cone was probably four ounces. Unfortunately, the upsetting of the ether-bottle during the stage of excitement made it impossible to measure accurately the amount, but four ounces would be a maximum and three and one-half ounces a minimum estimate. The anæsthetic was withdrawn during the dressing of the patient, and when the dorsal position was resumed, the writer noticed that the man began to get cyanotic, and that his respiration seemed to hesitate, as though he were about to vomit. He was then moved to bed and carefully protected against exposure by being covered, although the day was a rather balmy day (May 24, 1903). The writer stayed with him, noting that he did not vomit and that the cyanosis increased. It was evident that something vital was wrong, and the operator was immediately summoned. By this time (about ten minutes after his return to bed) the man's color was a livid blue and his respirations were beginning to lose their force, although the rate had not materially changed. The writer pushed his finger gently down the patient's throat in order to ascertain whether by some inadvertency he had regurgitated and

then inspired a bolus of food, though this seemed highly improbable, because it had been noticed that he had made no œsophageal movements. The writer passed his finger over the epiglottis and into the cavity of the larynx, and as far as he could reach nothing foreign was encountered. He then put his ear to the patient's chest and to his amazement found a very active universal acute œdema of the lungs in progress. The pulse at this moment was of good quality, about 120 beats to the minute, and the pupils were small and slightly active to light. The patient was given a hypodermatic injection of atropine sulphate, a twenty-fifth grain, and the foot of the bed was slightly elevated to an angle of perhaps fifteen degrees with the floor. Dr. Chetwood then instituted very active dry-cupping with wine-glasses over every part of the chest without turning the patient over. At this moment the patient's heart began to fail, and he was given strychnine sulphate, a twentieth grain, through the needle. With great caution the patient was now rolled upon his right side, and while the writer continued on duty at the head holding the tongue and jaw well forward and, while Dr. E. L. Keyes, Jr., kept the bedclothes from pressing on his abdomen, which up to this moment almost alone had been carrying on the respiratory function, Dr. Chetwood continued the cupping all over the back of the chest. Artificial respiration was not employed at this or any other period of the resuscitation. For the next few minutes, while the cupping was continued, the patient's condition remained unaltered, and then the heart began to show signs of weakness again; he was given two syringefuls of whiskey and another injection of strychnine, bringing its total up to a tenth grain. Auscultation of the chest at this moment showed that the râles were beginning to disappear, although the color was still anything but satisfactory and the pulse was still weak. Auscultation of the heart showed pure muscular tones, so that Dr. Chetwood and the writer remarked that hope of his recovery was appearing. Oxygen arrived about this time, and was administered in the usual manner as rapidly as the patient could possibly use it. His color now began to improve slowly, but his pulse was still unsatisfactory. He accordingly received nitroglycerin, a twenty-fifth grain, hypodermatically, from Dr. Keyes. This was at the end of about forty minutes of work upon the patient. In a few

moments the great value of this injection appeared and the pulse became much stronger and bounding. When this condition was apparent, the foot of the bed was raised to an angle of forty degrees with the floor. These two details of treatment, the large dose of nitroglycerin and the increase in the inversion of the body, appeared to have accomplished, next after the cupping, more than any other one element of treatment. From that moment on the patient's condition became promising, but the responsibilities of the issue were great enough to warrant a consultation, and accordingly Dr. Walter B. James was called. His physical examination confirmed our findings, viz., that the râles had disappeared from the entire chest with the exception here and there of an occasional "click." He also agreed that the heart, all things considered, had returned to practically its normal condition, but recommended, as a general cardiac support and as a final precaution, that five minims of the tincture of digitalis be administered. This medication was the last the man received. Dr. James also concurred in our prognosis that the patient would recover, and believed that no late lung complications would appear. A few moments after Dr. James's withdrawal the case was left in the writer's hands, and he used the following course of treatment during the next hour and a half: The respiration steadily gained in force and decreased in frequency, until after about one hour the cyanosis of the face, mucous membranes, and finger-nails, which were carefully compared with those of by-standers as standards, had disappeared. Every ten minutes the front and sides of the chest were auscultated, and every twenty minutes the patient was rolled upon his side and the back of the chest was auscultated. At none of these examinations were there râles, but a click (without dulness) was present at inspiration only in the left infraclavicular region, which had totally disappeared by the time Dr. E. L. Keyes, Jr., assumed charge of the case early in the evening. The pulse was at this time steady and regular at about 80 to 90 beats to the minute, of good force and quality, and the heart sounds were firm and muscular. The capillary circulation was efficient wherever and whenever tested by pressure over a bony prominence, to squeeze out the blood and observe its return, for instance, at the finger-nails. The pupils at this stage were moderately dilated and very reactive to light.

The action of the pupil was throughout the case very interesting. At no time was reaction to light totally abolished, and only for brief intervals was the pupil widely dilated, notwithstanding the fact that the patient had received rather a large dose of atropine. The effect of this drug on his respiration and circulation was admitted, but for some unknown reason the pupil showed scarcely any effect whatever. All the drugs administered were from the author's hypodermatic set, always carried for emergencies in solution. It is possible that the atropine had lost its activity on the pupil. This is not likely, because the chemist of the New York Hospital states that solutions of atropine there have not been known to deteriorate, although kept in stock indefinitely in the same kind of rubber-capped half-ounce bottles as the writer always carries. No morphine was at any time administered. Oxygen was inspired by the patient constantly from the time of its delivery at the house up to about one hour after the writer was left alone with him. It was suspended when no further improvement of the color continued, and when his parents admitted that his visage was, as far as they could see, perfectly normal.

Conjunctival reflex was present in a moderate and sluggish degree just before Dr. Chetwood and Dr. Keyes, Jr., left, and in an active degree about a half hour later. No vomiting whatever occurred until some time after the cyanosis was absent, when, without warning, the patient, with a loud, shouting phonation, vomited up a few drachms of mucus, and then answered slowly when called by his mother, and looked in a dazed fashion at the writer when he likewise addressed him. About a half hour after this the patient repeated the vomiting and was able to ask why he had a sore chest.

One extremely interesting feature throughout the convalescence, which was noticed by all present, was that there was at no time any perceptible mucus in the trachea, larynx, or mouth. This was true during the initiation and maintenance of the anæsthesia and the convalescence. Although the patient vomited a little mucus, he coughed up absolutely none. The whole disease process appeared to have found its origin in the air-vesicles, to have reached its acme there, to have run its course there, and to have ended there.

The behavior of the heart was most instructive, because, while the œdema was developing, its action was, broadly speaking, normal, although accelerated, and only after the œdema was so fully established, that the respiratory function had begun to fail, were unfavorable signs from the heart noticed. It seemed probable, therefore, that the œdema was primary in the lungs and not in the right heart.

It matters not which of these two conflicting views be correct—whether the œdema had been primary in the lungs, and only when of sufficient degree to interfere with the circulation had caused cardiac obstruction, and then incipient cardiac failure, or whether the ether had had, as it occasionally does, a selectively depressing action upon the right heart, and after having excited this phenomenon primarily, had set up œdema in the lungs secondarily.

The case is positively the most interesting in the writer's experience in anæsthesia work, and he believes it to be one that is not without clinical importance. There are very few cases of acute œdema of the lungs secondary to ether narcosis reported in literature. F. W. Hewitt (called Case XVI in the closing table of this paper), in his admirable work on "Anæsthetics and their Administration," alludes to a fatal pulmonary œdema in a patient who was the victim of paralysis of the diaphragm, which no doubt in itself was an important causative factor. In the patient under discussion, however, the diaphragmatic respiration was practically the only one at work during the acme of the trouble, so that a parallel between these two subjects cannot be appropriately drawn.

The only other case of œdema of the lungs under anæsthesia, which the author has himself seen, was at the Sloane Maternity Hospital. The subject was a negress, about thirty years old, suffering from eclampsia. *Chloroform* was being administered by him drop by drop with the utmost precision and caution, when prior to circulatory difficulty the œdema began. This patient was saved in exactly the same manner as the writer's male subject, namely, by active dry cupping over the whole chest, first on the front and sides and then, after

these had improved, on the back. Veratrum viride was employed to dilate the arteries and quiet the circulatory excitement, which was very marked. No parallel may be drawn between this case and that which has been described, because the eclampsia itself may have been partially or totally the cause of the trouble, and the anæsthesia a mere incident: moreover, ether was not employed at all.

DEDUCTIONS.

The lesson which is to be drawn from this case, which might quite well have been a fatality, is that ether even when given carefully may occasionally cause pronounced and dangerous irritation of the air-vesicles. The man probably received somewhat less than four ounces in from thirty to thirty-five minutes of administration, but the operation was rectal, and resistance to ether was present in his nervous system throughout that time. Consequently, the writer is of the opinion that the œdema was not due to an excessive amount of ether. The œdema may, however, have been induced by the circumstance that when rigidity appeared in the extensor muscles traditions of training and observation were followed in pushing the ether rather rapidly to overcome this complication. It is conceivable that the irritation of the lungs began with this *concentrated* dose of the anæsthetic, although in actual amount it should not be considered proportionately excessive; and although at the moment no unfavorable reaction on the part of the patient was observed, and ten minutes (a proper delay) elapsed before the operation began.

Since this case occurred, the writer has followed the practice in his own work and in the teaching of those he has had the pleasure to meet as instructor, that when any such resistance to the anæsthetic occurs, it is best to wait patiently for it to disappear under a steady and gradually increasing exhibition of the anæsthetic. In this way he does not like to have an operation begin on such a subject much short of ten minutes after the beginning of the inhalation of the drug, whereas under

the former procedure the work usually began in less than half this time. He has been rewarded by finding that cases which promised to be troublesome by some such incident at the beginning have followed an anæsthesia with much less difficulty, or none throughout. The principle at stake is that of teaching a boy to swim. If we throw him off the dock into deep water his danger of drowning is extreme, whereas, if we lead him gradually, he may by instinct take care of himself by swimming in water sufficient for that purpose and yet not really beyond his depth.

Another lesson which the writer draws from this case is that of listening to chests after ether narcosis, whether the patient does well or not under it. He has been astonished to find the great number of subjects who show râles in the chest here and there, even when the bronchorrhœa has been immaterial or absent. When the bronchorrhœa is extreme, the noise transmitted down the bronchi is so great that the distinction between the transferred sounds and sounds within the air-vesicles may scarcely be made.

The cases to which attention is drawn, however, are just the opposite of these, namely, where, with a clear throat and free trachea, bubbling sounds are present here and there over the thorax. Putting these two facts together, as the basis of present practice, the writer now takes time, and if necessary plenty of it, to get the patient thoroughly under the ether slowly before he is transferred to the operating table. In the case reported, ten minutes' delay in this process was made; doubtless much longer time would have been better.

In connection with the subject of râles after ether narcosis, the writer has been informed that at the Royal Victoria Hospital in Montreal all subjects of etherization are during convalescence from narcosis protected with a pneumonia jacket: a most wise precaution, simply taken.

A third lesson indicated by the case is that elevation of the foot of the bed has a very great beneficial influence on these patients. Many hold that more harm than good is done to a failing heart by this procedure. With this view the writer dis-

agrees, and believes that the procedure of first elevating the bed slightly and then fully, contributed very materially to the recovery of this patient. In fact, when the second elevation was done, Dr. E. L. Keyes, Jr., remarked that it appeared to have benefited the clinical conditions better than anything else tried. The writer thinks that when difficulties after operations arise, one should consider what the condition of the blood within the patient is, namely, that the great veins of the abdomen, which are capable of holding all the blood of the body, are at the moment, in fact, thus distended, either through the failing heart or the shock of the patient. Against this inert accumulation the heart must work while the arteries themselves contain too little blood to constitute the normal bulk of fluid for propulsion. It is therefore rational to believe and to practise that an elevation of the foot of the bed just sufficient to make the blood flow out of the veins into the heart slowly, to be sure, and under low pressure, so that the intermittent heart action may accommodate it, is exactly the kind of aid which the heart needs to supply it with the blood required to combat this disadvantage of failure, whether from shock or from paresis of its own muscle.

The writer believes, therefore, that this middle view between extreme elevation, which might engorge and stop the heart, and no elevation, which might embarrass it through lack of blood to pump through the arteries, is the correct and rational procedure. He considers the other dictum wrong in refusing to elevate the bed at all, but right in stating that it should not be elevated to the extreme.

Hewitt says in his book: "It is a popular fallacy to imagine that because heart sounds are normal and no visceral disease can be detected, the anæsthesia will run a perfectly normal and straightforward course." This statement agrees perfectly with the writer's experience, which is now considerable, and only reinforces the statement with which he would close this section of the paper, namely, that it is proper to allow the anæsthetist plenty of time to find the pace of his subject in order to run the race of the operation evenly with him. For the

purposes of comparison and for the sake of completeness, it has seemed well to include in this discussion similar cases reported in literature. For the following list of cases the writer is indebted in large part to Dr. Edward W. Preble of this city, who very kindly and faithfully looked up the matter.

CASE I.—MORTON (*American Journal of the Medical Sciences*, vol. lxxii, New Series, 1876, page 411). Patient aged nineteen years; male; no history of winter cough or previous chest trouble; general health not vigorous, but not markedly impaired by spinal (probably spondylitis) and knee lesions; no evidence of hereditary disease; operation for ankylosis of the knee, June 3, 1876; narcosis lasted twenty minutes; 2½ to 3 ounces of ether used poured upon a towel, no inhaler as such employed. At the close of the operation, pallor and depression, with the usual postoperative degree of comfort, present; fifteen minutes after operation, and during consciousness, asphyxia developed, most marked in the face and finger-tips; pulse moderately full, about 160; respiration nearly ceased; tongue depressed, and cold water dashed upon the chest; only violent respiratory movements followed; a half-hour later the heart still acting, though labored, and throat filled with bloody mucus; evidences of pulmonary engorgement present; radial artery opened, 8 ounces of blood withdrawn and dry cups applied to the chest; for a time respiration improved, and volume of pulse increased somewhat and fell from 160 to 152; hypodermatic injections of whiskey and carbonate of ammonium failed to revive him from a sinking spell, during which he died after about another hour, that is, about two hours after the operation. The autopsy showed pleuritic effusion, old "infiltrating" pleuritic adhesions scattered everywhere, most marked at right base; œdema of the lungs; deformity of chest; lumbar kyphosis; displacement of abdominal viscera, and fluid in the pericardium. (No note as to renal or encephalic conditions.)

CASE II.—SAUNDBY (*British Medical Journal*, October 13, 1877). Patient aged thirty-five years; female; October 4, 1877, operation for ankylosis of the knee; "about an ounce" of ether; Ormsby inhaler; narcosis normal throughout; recovery from the anæsthesia; one and a half hours later developed cyanosis; failure of the pulse; râles over both lungs. The patient was well wrapped up and carried directly from the operating theatre across an open court to a detached building of the hospital, fifty yards away. Was conscious upon reaching the ward, and spoke to the nurse, who noted nothing unusual in the patient's condition. This procedure of carrying the patient across the court-yard was contrary to the rules of the hospital, and happened in the absence of the house-surgeon. Saundby adds that he cannot state whether or not this exposure had anything to do with the œdema. The autopsy showed effusion into the arachnoid; œdema of the lungs; but otherwise negative.

In the opinion of the author, exposure during the operation at any time, excepting as absolutely necessary and during convalescence from the anæsthetic, in any way, is extremely hazardous. His practice is to direct that the patient be kept covered most carefully and completely, excepting the face for breathing, until complete consciousness is restored, so that the patient may direct the attendants himself as to his feelings of chilliness or warmth. Protection against draughts and changes in temperature is also of extreme importance. All patients perspire slightly, and most patients very freely during the later stages of narcosis and during recovery. Any exposure which tends to check this activity of the skin must be very dangerous to both the lungs and the kidneys. It is probably proper to observe that the exposure noted by Saundby was undoubtedly a very important feature in the case. This opinion is borne out by one experience which the writer has had in the only fatal pneumonia he has had among his anæsthesia patients, which occurred as follows: A perfectly healthy, middle-aged man was under ether fifty minutes for a difficult herniotomy, and consumed two and three-fourths ounces of ether (measured) through the Bennett inhaler, with the upper air-valve open, without any unfavorable symptoms whatever, excepting very free perspiration. The writer was excused by the surgeon to go to another case, and therefore did not see the patient put to bed and could not carry out his usual precautions of protection, as just stated. The surgeon later admitted not only that they were not carried out, but also that a window at the head of the bed and a door at the foot of the bed were left open by the nurse, apparently on the supposition that the hot air of August would do no harm. Congestion of the lungs at once developed, and after three or four days double pneumonia appeared, lobar in type, most severe on the right side, which was the nearer to the open window. The opinion of the medical consultant is quoted in saying that the ether itself had nothing to do with the case, because the pneumonia was lobar in type, and developed so long after the narcosis.

The exposure, in his opinion, on top of the perspiration spoken of, probably was the exciting factor.

It is well to call attention again to the pneumonia jacket used in some hospitals during recovery from ether narcosis.

CASE III.—PARSONS (*Medical News*, March 18, 1882, page 295). Female; aged fifty-four years; normal heart and lungs; reduction of old dislocation of the shoulder, February 16, 1882; narcosis lasted twenty-five minutes; 6 ounces of ether inhaled (method of administration not stated). Recovered from the anæsthesia within five minutes; in one and one-quarter hours cyanosis developed, with death following upon a high degree of pulmonary congestion. Five minutes after the reduction the patient asked for a drink of water, and a little later wished to go home. After attending to a few remaining patients, the doctor left her in charge of a friend and the janitor; after about a half hour she was again seen by the anæsthetist, and an hour later the house-physician was notified that she was dying; he then found her in a cyanosed condition. Two hypodermatic injections of ether were given, 20 minims each, and three or four injections of brandy. Twelve or fifteen dry cups were applied over the chest and other stimulating remedies resorted to; death occurred about one hour after. The autopsy showed heart, liver, and one kidney normal; the other kidney was slightly fatty. The lungs were deeply "congested," thus causing her death.

In the opinion of the writer, the following comment may be offered. This operation was performed in New York City during February. If the janitor and friend referred to were at the patient's house (the original article is by no means definite on this point), the patient was allowed to go home a very short time after recovery from the anæsthetic. This exposure must have been, as in Saundby's case, a very important, exciting feature in the issue of pulmonary congestion, coupled, of course, with the basis laid for the lesion by the ether itself.

CASE IV.—HUTCHINSON (*Lancet*, 1885 vol. i, page 178). Male; aged sixty-two years; January 14, 1885, for reduction of old shoulder dislocation; carried out in the Out-Patient Department of the London Hospital in the winter-time. Ormsby inhaler used, air-cap slightly open; induction of anæsthesia within the usual time. The reduction of the dislocation was not satisfactory, so that the anæsthesia was resumed for a short time with whatever ether was in the inhaler. The patient now began to look pale and to breathe very feebly; brandy hypodermatically was administered over the heart. The tongue was drawn out and artificial respiration was begun. Electricity was used to the nerves of the neck; duskiness of the skin increased and efforts at artificial respiration

failed of result, although continued for a half hour. Upon the removal of the inhaler the second time, there was at first no anxiety; there had been struggling during the first administration, but none during the second. No food had been taken, and no lung trouble was admitted by the patient, although he was evidently short of breath. The autopsy showed emphysema of the lungs, congestion, bronchitis, and mucus in the bronchi; the lower lobes did not contain much air, and there was more œdema in the upper parts. The trachea was congested and contained frothy mucus; the heart was fatty, the pericardium was adherent, the other organs were healthy. The pathologist thought death was due to fatty heart and emphysema. The patient had not been well for some time before, and had fainted not long before applying at the hospital.

This operation also seems to have taken place in the winter-time. It is possible that the exposure, unavoidable in an Out-Patient Department, may also have been a cause of the œdema.

CASE V.—JACOB (*British Medical Journal*, 1885, page 887), in a table of deaths under anæsthetics, notes the following: Female; aged sixty-four years; ovariotomy; death seventeen hours after operation with symptoms of pulmonary œdema; no autopsy.

CASE VI.—E. GURLT (*Archiv für klinische Chirurgie*, Band xlviii, page 273), quoting Trendelenburg. Female; aged thirty-five years; cholecystenterostomy; narcosis one and a half hours; normal but with appreciable salivation and repeated vomiting (method of administration omitted); upon coming out of the ether loud mucous râles were heard in the trachea and bronchi over both sides; the symptoms grew worse; death occurred thirty-two hours after narcosis, apparently of œdema of the lungs. On the next day after the operation the condition was difficulty in expectoration on account of the abdominal wound. Trendelenburg adds that it is doubtful whether the ether caused the death; the patient had carcinomatous lymph-nodes in the abdomen, perhaps secondary to a tumor of the pancreas. She may have suffered from pulmonary metastases. No autopsy was allowed.

CASE VII.—GRANT MORRIS (Proceedings of the Society of Anæsthetists, *Lancet*, May 7, 1898) reported as follows: Female; thirty years old; pain in the region of the left kidney; cachexia; trace of albuminuria on admission, but none on the day of operation; exploratory laparotomy; ether from Clover's inhaler, not pushed, taken normally; slight cyanosis; much frothing at the mouth towards the end of the operation. No alarm occasioned. Patient taken from the table after sixty-five minutes still cyanosed; respiration unimpeded but shallow and sighing; appeared about to vomit; no evidence of obstruction to breathing; conjunctival reflex present; pupils equal and contracted. In fifteen minutes became ashy pale; first the respiration and then the pulse ceased; artificial respiration brought away much frothy, watery secretion. The autopsy showed lungs full of frothy secretion. Death due apparently to failure of respiration from acute œdema of the lungs set up by the ether. There was no hemorrhage into the medulla.

CASE VIII.—In the discussion at this meeting, SILK said he had witnessed a similar case; much ether had been inhaled; the lungs were water-logged from acute œdema. He stated that in his opinion artificial respiration is dangerous in these cases.

CASE IX.—At the same meeting, DR. STARLING thought that renal diseases might be a feature in producing acute œdema of the lungs, and instanced a case supporting this view.

CASE X.—POPPERT (*Deutsche medicinische Wochenschrift*, 1884, 37, pages 719 to 722). Male; forty-six years old; farm-hand; previous good health; no cough; long-standing alcoholic habit, moderate in degree for one and a half years previous to admission. Admitted May 20; right inguinal hernia in the early stages of irreducibility and inflammation; medicinal treatment until May 31 . Ether narcosis; radical operation for irreducible inguinal hernia; small abscess in the sac and recent adhesions; no perforations; wound packed; no bowel reduced into the abdomen. Narcosis lasted thirty minutes; 130 cubic centimetres of ether used; Czerny's, then Juillard's mask employed; anæsthesia slight; subconscious movement; slow, strong pulse; slight cyanosis; regular respiration; one emesis of gastric mucus; mucus râles toward the close of narcosis; prompt recovery of consciousness; no immediate complications; after more than an hour increasing dyspnœa with loud râles, frequent cough, and much mucous sputum appeared. The pulse was so strong that no stimulants were needed, and the diagnosis was rendered of unusual accumulations of mucus, which the patient, being fully conscious, was expected to cough up for himself. (There is no note of any physical examination of the chest.) Rapid heart failure with progressive cyanosis, accompanied by large quantities of blood-stained mucus in the nose, mouth, and throat, appeared, and death supervened during manifest œdema of the lungs.

The autopsy was held on the day of death and showed generalized peritonitis with recent adhesions, two intra-abdominal abscesses, hernial canal admitted several fingers. Contents of sac adherent; normal heart; slight aortic sclerosis; lungs slightly emphysematous, very markedly œdematous; the trachea and bronchi were filled with blood-stained, watery mucus. The other organs were normal. The cause of death was assigned as acute œdema of the lungs.

No note is given of treatment directed against the œdema of the lungs, hence no one may say whether or not it was suspected until its discovery was too late to be of value to the patient.

CASE XI.—RIEDEL, quoted by E. Gurlt (*Archiv. f. klin. Chir.*, xlviii, page 264). Male; forty-four years old; admitted November 11, 1893; previously healthy, excepting abdominal pains progressing steadily and not relieved by lavage; no jaundice; powerful, well-nourished man; normal temperature; normal urine; emphysema; normal heart; tenderness over gall-bladder. Operation, November 12, 1893; exploratory laparotomy under morphine and ether (quantity and inhaler not stated); narcosis forty-five minutes long, with great cyanosis; recovery prompt, with

mental disturbance; pulse 80, regular, full, strong; rather feeble respiration.

November 13, about the same general condition, excepting increased mental disturbance; no vomiting; no abdominal pain; spontaneous urination; in the afternoon, pulse 96, weaker than before, but still rather strong; food refused; death thirty-three hours after operation. Autopsy on November 14 showed emphysema, œdema, early infiltration on the surfaces of the lungs; atheroma of aorta, shortening of one aortic valve, narrowing of coronary arteries, slightly fatty heart.

Gurlt considers this case one in which œdema of the lungs was important. No note is given of the manner in which the ether was given, and none of measures adopted to combat the œdema. The latter fact, and the absence of statement of signs of the œdema during life, raise the question whether, after all, this condition was so etiologic as Gurlt in his table describes.

CASE XII.—J. KAARSBERG (*Centralbl. f. Chir.*, 1896, page 337), June 16, 1889; female; ovariotomy; anæsthesia forty-five minutes long; 150 cubic centimeters of ether (inhaler not stated); normal narcosis; cessation of respiration during dressing; easy artificial restoration, but prompt recurrenceof cessation after a few spontaneous respirations; for seven and one-half hours artificial respiration was continued, then death; pulse continued strong up to within an hour of death, when râles and cyanosis demanded venesection; no return to consciousness; autopsy showed œdema of lungs; fatty heart; senile atrophic kidneys (brain examination for lesions of the fourth ventricle not reported).

CASES XIII and XIV.—ROSING-HANSEN (quotation, *Centralbl. f. Chir.*, 1896, page 338) reports two cases of fatal œdema of the lungs secondary to ether narcosis for placenta prævia. Great anemia was present in each instance, so that the author raises the question as to whether the anemia or the ether was the more potent factor, and concludes that the ether was the cause, because anemia cannot be regarded as having that relation to œdema of the lungs. No report is given of means adopted to treat the œdema.

CASES XV and XVI are the author's patients with piles and eclampsia respectively, discussed previously.

CONCLUSIONS.

Mere tabulations of the important elements in monographs of this character very rarely have definite value. It is hoped, however, that the grouping into paragraphs of the rather essential details will be instructive and serve as a suitable termination of the paper.

1. The *quantity of ether* used in six cases in which this particular is stated averaged 4 ounces. The extremes were

1 ounce and 6 ounces. In Case VIII "a large amount" was used. No quantity is given in IV, V, VI, VII, IX, XI, XIII, and XIV. The quantity of drug employed is, provided the limits of intoxication are not approached, of comparatively little moment. The best measure of the amount of ether to be used is the patient himself as regards his symptoms and not a glass graduate. Thus it is certainly possible to overwhelm a patient with a few ounces, which would scarcely affect a very similarly constituted individual. The proper procedure is steadiness of increase of the concentration and deliberation in the presence of even slight difficulties. Incautious haste (merely to save time which should properly be devoted to securing the patient's safety) and rapid concentration of fumes mark the course of danger.

2. The *form of inhaler* was the bag-type (improperly called "closed" method, properly called "regulable" method, because the valves allow of perfect adjustment to the indications) in II, IV, VII, XV, no inhaler at all as such in I, and is not stated in III, V, VI, VIII, IX, XI, XII, XIII, XIV. Czerny's and Juillard's masks were used in X, whose precise nature cannot be determined through the New York dealers.

The control of conditions by means of the valves and the warming of the ether fumes by means of the bag make the regulable or bag inhalers by all means the safest and best. In the hands of the indifferent, however, undue concentration of fumes may be rapidly and intensely attained. No one therefore should begin to employ these inhalers without careful study of their mechanism first, and, second, instruction from an expert. It is possible by haste, carelessness, and inaptitude to render the position of a patient in any narcosis one of danger, no matter what inhaler is employed.

3. *Recovery of consciousness or "from the ether"* is stated to have been complete in I, II, III, X, XI, XV, incomplete in VI, and is not noted at all in IV, V, VII, VIII, IX, XII, XIII, XIV. It is possible to argue from the number of prompt restorations of consciousness that true intoxication with ether is not by any means an essential to the œdema, and

it is also fitting, therefore, to repeat that manner of administration and other circumstances in the management of the narcosis and convalescence are the etiologic factors.

4. The *nature of the operation*, probably of no moment, excepting when the air passages themselves are being invaded, was reduction or other invasion of joints in I, II, III, IV, laparotomy in V, VI, VII, XI, XII, herniotomy in X, midwifery (pacenta prævia) in XIII, XIV, not stated in VIII and IX, piles in XVI. It is well to note that two (III and IV) of the joint cases were treated in out-patient departments, where exposure to cold is almost unavoidable, and one (II) was confessedly very greatly subjected to check of perspiration and change of temperature. It is thus worth while to repeat that too little attention to this protection is given by surgeons, assistants, nurses, and other attendants. Operations under ether in out-patient departments are probably very dangerous on account of the conditions of temperature and ventilation.

5. The *average duration of life after the operation* was eleven and three-fourths hours in seven cases; the extremes were one and one-third hours and thirty-three hours. Unsatisfactory or no statement on this point is given in IV, V, VIII, IX, XI, XIII, XIV.

6. *Age* and *sex* are, as in all narcosis, of little importance excepting as they are concerned in the diseases most common to the various periods of life and to the two sexes. The average of 12 stated ages of these patients was 41 years and the extremes were 19 and 64 years; the females numbered 7 and the males 5. Age and sex are not given in 4 reports.

7. *Previous good health* is stated to have existed in Cases X, XI, and XV; ill health in reports I, IV, VI, XIII and XIV, while notes on this point are wanting in histories II, III, V, VIII, IX, and XII. This detail does not take in autopsy findings.

8. The *forms of ill health, independently of post-mortem examinations,* are given as " not vigorous" in I; evident dyspnœa in IV; carcinomatous lymph-nodes secondary to cancer of the pancreas in VI; nephritis in VII (?), IX; anæmia sec-

ondary to hæmorrhage of placenta prævia in XIII and XIV; and piles in XV.

The reporter of XIII and XIV thinks anæmia of little importance in these cases. The writer, however, while instructing the members of the house-staff at the Roosevelt and Polyclinic Hospitals never has seen an anæmiac do well if the ether or chloroform be carelessly handled. The depression of the anæmia multiplies susceptibility to all drugs, and thus that to the dangers of anæsthetics.

9. The *autopsy findings* were as follows: Disease of the pericardium, heart, arteries, and valves, was in some form present in I, IV, X, XI, XII; disease of the pleura, lungs, trachea, and bronchi (other than œdema) was in some degree proved in I, IV, X, XI; disease of the kidneys of distinct form was established in III, XII; disease of the abdominal viscera, including hernia and peritonitis, but excluding the kidneys, was in some type present in I (displacement by deformity) and X. Lesions of the brain were found on autopsy in II, pronounced absent in VII, and were not sought, though possibly present, in XII.

10. *Œdema of the lungs* was diagnosed as a distinct entity by physical examination and clinical signs in I, XV, II, III, V, VI, IX, X, XII, XIII, XIV; by autopsy in III, IV, VII, X, VIII (by inference), XI.

Œdema of the lungs is regarded as the chief cause of death in II, III, VII, and may possibly have been such cause in I, IV, VIII, IX, X, XI, XII, XIII, XIV. Notes in V and VI are too fragmentary for classifying.

Œdema of the lungs though present was not fatal in XV.

11. No *treatment* is stated in II, V, VI, IX, XI, XIII, XIV. *Treatment of the œdema* was venesection in I and XII; dry cupping in I and XV; free cardiac and respiratory stimulation in I, III, IV, and XV; artificial respiration in IV, VII, XII; electricity to the nerves of the neck in IX; stimulation of pulse was omitted intentionally in IX; artificial respiration is regarded as dangerous in VIII; an opinion concurred in by the writer, because it serves only to pump the serum from the ves-

icles into the bronchioles and bronchi, where it simply clogs the main channels of the air current. Elevation of the foot of the bed moderately at first and then fully is stated to have been used only in XV. Stimulation of the pulse with arterial dilatation is stated to have been employed only in XV. Dilatation of the pulse with veratrum viride was carried out only in XVI, the case of eclampsia.

The deductions from these facts which may be drawn are that the best treatment of the œdema is active dry cupping, and of the circulation in asthenic cases is free use of nitroglycerin and strychnine, elevation of the foot of the bed moderately at first, later fully, and of the circulation in sthenic cases is venesection or judicious use of the aconite group.

The *best prophylactic measures* are certainly deliberate uniform administration and the most adequate possible protection of the patient from draughts and changes of temperature during the stage of perspiration in convalescence.

EXCISION OF PORTIONS OF THE CHEST WALL FOR MALIGNANT TUMORS.[1]

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MALIGNANT growths of the chest wall as seen clinically are chiefly of two classes, carcinomata, secondary to primary tumors of the breast, or sarcomata (including endotheliomata) arising from the ribs, periosteum, skin, pleura, etc.

In these days of radical operation for cancer of the breast, which is apt to be performed earlier than formerly, the prognosis is far better than it was a few years ago; but still a considerable proportion of cases exhibit regional recurrences in spite of most radical work. These occur frequently in the chest wall itself and at various points along the path of the lymphatics leading from the mammary gland. Such recurrences may form anywhere along the inner side of the ribs or make a chain of nodules reaching to the spinal column, but are more common at the inner ends of the ribs or more accurately of the intercostal spaces where the branches of the internal mammary artery perforate the chest wall, presumably because of the passage here of numerous lymphatics on their way to the mediastinal glands. In two of the cases here reported the local recurrence was in a lymph gland situated in the intercostal space at its inner end.

In a number of instances the writer has seen such local recurrences after radical removal of tumors which had not yet become attached to the chest wall, but were still freely movable, and also in cases where the primary tumor was in distant portions of the breast. It would seem that lymphatic infection at the edge of the sternum is comparable in frequency to that of the axillary glands, which would suggest the systematic removal of all subcutaneous tissues in this region down to the

[1] Read before the American Surgical Association, July, 1905.

perichondrium in all cases of carcinoma of the breast, whether the tumor be in the internal or external portions of the mammary gland.

In a certain proportion of cases these recurrences are local when discovered and may be successfully removed. The removal, however, requires resection of considerable areas of the chest wall, including all of its structures and entails opening of the pleural cavity on that side together with plastic closure of the defect.

It may be stated more broadly that regional recurrence after radical operation for carcinoma of the breast is very apt to involve the chest wall, and if such a nodule is to be successfully removed the underlying portions of the chest wall must be removed with it. This follows because in the modern radical operation for carcinoma of the breast practically all the subcutaneous tissues are removed from the whole breast area down to the periosteum and intercostal muscles, and any recurrent nodule growing beneath the skin may be considered to have invaded the intercostal muscles by the time it has become large enough to be detected. This is quite as true where the recurrence is the result of scattering of cancer cells in the connective tissue spaces as in purely lymphatic recurrence. Lenticular skin metastases in their beginnings are an exception to this rule.

Mr. Jacobson advises operation in such cases, which he says may be done with the expectation of at least delaying general infection with the disease. He reports one case, however, in which the patient was free from recurrence two years after resection of the chest wall.

Sarcoma of the chest wall may arise in any of the structures from the skin to the pleura, but the more common varieties grow from the ribs or their cartilages or the periosteum. The operative relations of sarcoma are not materially different, save for the fact that some of the varieties are encapsulated. Infiltrating sarcomata require the widest and most radical removal, while the encapsulated tumors and particularly the desmoids and the giant-celled sarcomata and often the

endotheliomata may be enucleated. Still even here the section should be made well outside the capsule since such capsules are themselves often infiltrated.

The following statement of the technique to be employed in such cases is based upon the experience obtained in the cases here reported:

A wide skin incision is made of such shape as to be readily closed by some simple plastic procedure. A curvilinear triangle answers admirably.

The chest is then opened through an intercostal space at some distance from the tumor sufficiently to permit of exploration of the inner surface of the ribs in the neighborhood of the tumor. By this means much can be learned of the extent of the growth and the presence or absence of involvement of the lung or pericardium. This will determine the area of chest wall to be removed. Of course it is of the greatest importance to take out the tumor in one piece without section of tumor tissue, but in some cases this may not be possible.

The ribs are first cut on the outer side, *i.e.*, the side of greater fixation preferably without cutting the pleura. By this means the intercostal arteries can be most readily caught by means of a curved needle carrying a catgut ligature. Further advantage lies in the fact that if the pleuroperiosteal section be made a little nearer the tumor than the bone section, the flap of periosteum and pleura will offer some protection to the lung from the sharp edges of the ribs.

In these cases there were no untoward symptoms incident to the production of pneumothorax. It was noticed, of course, that the respiration became immediately deeper and more rapid as soon as air entered the pleural cavity, but, aside from the violent flopping of the heart from right to left, terrifying to look at but without noticeable effect on the pulse, there was no special inconvenience to patient or operator. This is quite in accord with the statement of Dr. Park (ANNALS OF SURGERY, 1887) that one side of the chest may be operated upon without resort to artificial respiration, and with the work of other surgeons. A notable operation by Koenig, quoted by Park

(*Arch. f. klin. Chir.*, 1902, vol. xlvii, p. 314), might be mentioned. Trzebicky, in 1902, reported five extensive operations on the chest wall for the removal of tumors done without artificial respiration. This statement of Park may be worthy of reiteration here in view of the numerous apparatuses which have been devised to overcome the effects of the artificial pneumothorax. Doubtless Fell's apparatus and the Sauerbruch cabinet are of value in special cases, the latter essential in cases where there is likelihood of both sides of the chest being opened, but resection of the chest wall in the usual case can be done satisfactorily without these appliances. Dr. Keen reported a case in which he had removed a large sarcoma of the chest wall, and when the chest was opened he had tried to use Fell's apparatus without tracheotomy. The apparatus did not fit the face well and was discarded, and the operation completed without the occurrence of serious symptoms. The idea of Delagenierre that the chief danger in operative pneumothorax lies in the suddenness of its production (which led Dollinger to the establishment of an artificial pneumothorax under local anæsthesia twenty-four hours or so before performing an operation on the chest wall) is probably of considerable meaning and worthy of serious consideration. Probably, however, most of the advantages of Delagenierre's principle can be obtained during the anæsthesia by allowing the air to enter the pleural cavity only slowly, giving the system reasonable time to accommodate itself to the new condition.

In the cases here reported the writer found that the respiration could be greatly modified, and the tremendous lateral excursions of the heart and mediastinal tissues almost completely checked by the simple procedure of stopping up the opening in the chest wall with a wet towel. The towel, folded into two or three thicknesses, is made to slip beneath the partially loosened section of chest wall which is to be removed, and is drawn forward as new cuts are made. It is important to close the opening at the moment of complete expiration when the chest is largely emptied of air. When this was done the lung expanded and the exaggerated and fatiguing expiratory

efforts were at once quieted. When by gradual leakage considerable amount of air had accumulated in the cavity, the towel was readjusted and closure made again at the moment of complete expiration.

In those cases where the tumor was at the edge of the sternum, it was found convenient after cutting the ribs to raise the tumor to the inner side, bending the costal cartilages to permit of work beneath. The internal mammary artery was readily caught above and below by passing about it a curved needle armed with catgut and was tied before being cut. The section of the sternum was made with bone shears and included about half its width.

Removal of the tumor in several cases gave excellent exposure of the upper pericardium and of the mediastinum which in one or two cases showed enlarged glands which were readily removed with the surrounding fatty tissue.

The wounds were closed in each instance by a large skin flap lifted up from some convenient region, generally the upper abdomen where the laxity of the skin permits ready closure of the defect. In one case a flap was taken from the opposite side of the chest, the very full breast being held towards the median line with adhesive plaster: this with reference to Dr. Richardson's notion of using the opposite breast to assist in closing the large wound left by the radical operation for carcinoma of the breast. The amount of air left within the chest was made much less by letting it out during expiration and preventing its reëntrance by means of the closing flap, which to this end should be made somewhat larger than the opening in the chest wall. Absorption of the air was rapid so that in very few days the remaining pneumothorax was not demonstrable.

It was feared that the aspirating action of the lower pressure on the raw inner surface of the occluding skin flap would cause exudation in embarrassing amounts into the pleural cavity. This did not occur, however, unless in one case where a dulness was made out within a few days, but in this case there must have been some degree of infection, as the patient had a temperature of 100° to 103° F. for a week, and aspira-

tion failed to demonstrate fluid, probably a localized pneumonic process with pleurisy.

In all of the cases the respiration remained more rapid than normally for a week or more, for which I think the soreness incident to the movement of the ends of the ribs in the unhealed wound is quite as accountable as the remnant of pneumothorax.

The final condition of the wounds was satisfactory in all of the cases. Wide-spread but weblike adhesions were sufficient to prevent collapse of the lung during that operation in one case where a second operation was performed.

I would report five cases of resection of the chest wall for recurrent carcinoma of the breast in four patients and one of removal of the clavicle and first rib and portion of the sternum for sarcoma which in point of operative technique presented a number of similar conditions.

CASE I.—*Recurrent Carcinoma of Breast over Fifth Rib; Resection of Fourth and Fifth Ribs; no Evidence of Recurrence after Two Years.* Reported by courtesy of Dr. Stanley Stillman, of San Francisco.

Miss C. had been operated upon in 1899, at age of twenty-seven, by Dr. Lund, of Boston, for carcinoma of the right breast. In 1900 a recurrence in the scar was removed by Dr. Lund, in San Francisco, and in 1901 patient presented a hard, flat, immovable tumor about five centimetres in diameter situated over the fifth rib just outside the epiphysis. X-ray treatment was used three times a week for eighteen months. For a time the tumor grew smaller, then it began to increase in size, and radical removal was determined upon. Dr. Stillman removed some 5 centimetres of the fourth and fifth ribs with the adjoining intercostal tissues. Though the tumor projected through the chest wall, there were no adhesions to the lung and no mediastinal tumor was made out. The opening was closed by a skin flap lifted up from the abdominal wall. Recovery was rapid and uneventful. Patient was seen July 1, 1905, two years after operation, and showed no evidence of recurrence, but was in perfect health.

CASE II.—*Recurrent Carcinoma of Breast at Edge of Sternum; Resection of Fourth and Fifth Costal Cartilages with Edge*

of Sternum; Recurrence in Mediastinum after Eight Months; disappearing under X-ray, but reappearing Five Months Later.

Mrs. W., aged sixty-six years, had been operated upon by the Halsted method in January, 1902, for carcinoma in the outer upper quadrant of the right breast, which had been noticed for a year, and which had begun to invade the skin and had produced a large axillary tumor. In the operation everything had been removed from the edge of the latissimus dorsi to the sternum and from the first rib to the tenth. The skin wound was so wide as to require swinging flaps to effect closure. In November, 1903 (twenty-two months later), patient returned with recurrent tumor in the scar at the edge of the sternum over the fifth costal cartilage, 2 x 3 x 1½ centimetres in diameter, sharply outlined, but fixed. There was no evidence of axillary or other recurrence, and the patient being in good physical condition it was determined to remove that portion of the chest wall carrying the tumor. A curvilinear triangular incision 7 centimetres on each leg was made and a skin flap lifted up from the upper abdominal wall sufficient to close this defect. The pleura was opened enough to admit the finger, which showed that the tumor was of about the same size on the inner surface of the ribs as on the outer, but did not involve the lung. An area of chest wall about 7 centimetres in diameter was removed as described above. During much of the dissection the pleural opening was closed more or less perfectly by the hand of an assistant or by a wet towel, by which the respirations were kept quiet and but little deeper or faster than the normal. The skin flap was stitched in place over the opening with silk-gut sutures and the edges accurately approximated with catgut. Before sealing the wound, a pair of forceps was introduced between the stitches and the greater part of the air let out of the chest, the forceps being quickly withdrawn at the end of expiration. Immediately after the operation the respirations were 22, but as patient regained consciousness they increased to 40, probably as a result of soreness. On the second day they were 28 and remained at 30 for several days. On the eighth day the wound was dressed for the first time; it had healed by primary union save for slight redness of the wound edges, and on the eleventh day the stitches were removed, patient leaving hospital on the nineteenth day. On the

sixteenth day a few drops of pus appeared in the abdominal portion of the incision.

In September, 1904, patient returned, showing two pea-sized recurrent nodules beneath the skin in the mediastinum. Further operation was deemed useless and patient was referred to the X-ray department of Lane Hospital for treatment. After 20 treatments by Dr. Lehmann during eight weeks, the nodules were no longer palpable, and patient returned home. In February, five months later, I was informed by letter that one of the nodules had begun to enlarge again, and that patient was very weak, probably from internal metastasis.*

CASE III.—*Recurrent Carcinoma of Breast at Edge of Sternum; Resection of Third and Fourth Costal Cartilages with Half of Breadth of Sternum; Recurrence in Original Scar apart from Field of Last Operation; Pleural Carcinoma; Death from General Carcinosis Five Months Later.*

Mrs. D., aged forty-five years, was operated on in February, 1903, by Halsted's method for a large spherical, rapidly growing carcinoma of the left breast with large axillary tumor; patient was very fat and had noticed the growth only five months before. In July careful examination failed to show any recurrence. In November several small nodules were discovered in the lower anterior part of the scar and were excised, the dissection going only to the periosteum. In March, 1904, two other recurrent nodules were found at the border of the sternum in the original skin, the flap of the last operation remaining free. As in Case II, the region about these nodules, 12 centimetres in diameter, was excised. One of the nodules was seen to penetrate into the fourth intercostal space. The patient being in good condition the pleura was opened through an intercostal space nearby and the inner surface of the wall examined with the finger. The tumor did not appear to have penetrated to the pleura, and the lung was free, but an enlarged gland was detected at the edge of the mediastinum.

The fourth and fifth costal cartilages were then cut away, the internal mammary artery tied and cut, and a section of the sternum 1½ x 5 centimetres removed. A second enlarged gland in the mediastinum was removed with the fatty tissue about it. Because of the retraction of the lung, a large area of the chest

* Reported to have died August 13 of cerebral hemorrhage.

wall was exposed to view, but no further recurrences were evident. After operation the pulse was 96 and respiration 30, but patient complained of very great pain. For the next week there was considerable fever, 99° to 103° F., pulse 90 to 110, with a good deal of pain, evidently a septic pleurisy or superficial pneumonic process. On the fourth day patient was more comfortable and sat up in bed. Some dulness was detected, presumably from effusion. On the eleventh day stitches were removed and a small abscess evacuated in the abdominal part of the incision. On the eighteenth day patient left hospital, respiration still 30, pulse 110. In May, two months later, patient returned with small recurrence external to last operation, and with wide dulness over left chest. Several punctures with needle brought no fluid, the dull area being probably caused by pleural carcinoma; further operation was out of the question. Patient died in July, four months after the resection of the chest wall and seventeen months after the Halsted operation, twenty-two months after patient first noticed the tumor.

Case IV.—*Recurrent Carcinoma of Breast at Edge of Sternum; Inner Ends of First and Second Ribs and Portion of Sternum and Mediastinal Glands removed; Internal Mammary Artery tied at its Origin; Further Recurrence below; Resection of Third and Fourth Ribs; Patient well Six Months after Last Operation, Twenty-two Months after Halsted Operation.*

Mrs. M., aged fifty-three years, was operated on by Halsted's method in August, 1903, for a large suppurating carcinoma of the upper outer quadrant of the left breast with large axillary tumor. Patient was very fat, had noticed the tumor but four months before. This had been incised by the family physician for infection, suppuration continuing, and tumor grew out of the incision. After the operation much of the flaps used to close the incision about the drainage tubes sloughed and the resulting raw surface was so large as to require the application of Thiersch grafts, which was done as soon as the suppuration permitted. In August, a year later, patient returned with recurrence, 3 centimetres in diameter at the edge of the sternum, over the second intercostal cartilage. The tumor was widely circumscribed, the second rib cut across, opening the pleura 5 or 6 centimetres external to the border of the sternum and the internal mammary

secured by double ligatures in the second intercostal space and divided between. The first rib was then similarly cut and the sternum divided with bone forceps from below nearly in the middle line and as far as the level of the sternoclavicular joint. The mass was then turned upward to give access to the upper portion of the internal mammary artery, but it was not found practicable to secure the artery as high up as was desired, so it was caught in forceps in the first interspace and freed from the first rib. The tumor mass with first and second ribs, portion of sternum and sternoclavicular joint, was removed. It was then a simple matter to tie the internal mammary artery well above the position of the first rib and to remove the pleura and other tissues which had been in proximity to the tumor. The wound was closed with a large flap lifted up from the right side of the chest.

The patient was somewhat cyanotic during the early part of the operation (patient was very fat and had her chest cavity still further compressed by abdominal fat), but the pulse remained strong and regular. Through a considerable part of the operation the pleural cavity was well enough closed with a wet towel to permit of considerable expansion of the left lung, and when the towel was used the respiration was markedly quieter and approximated the normal.

After the operation the pulse was 82 to 100 and the respiration about 30. Primary union occurred and patient left hospital on the twentieth day. In the following November patient returned, but showed no evidence of recurrence. She was strong and well and able to do hard work. In January a small nodule was found at the edge of the sternum in the third intercostal space. A second resection of the chest wall was therefore done, since there was no sign of other recurrence, in which the third and fourth ribs and edge of sternum were removed. Gauzy but widespread adhesions of the lung to the parietal pleura prevented collapse of the lung so that the operation was much simpler than the previous one. It was interesting to note the demonstration of the portion of the heart which is uncovered by pleura, for this was beautifully shown when in expiration, the lung being confined by adhesions bellied forward all around this area.

On September 2, a third resection of the chest wall was done, this time for a recurrent nodule on the opposite side of the sternum. The inner ends of the second, third, and fourth ribs were

removed with the intervening soft parts as well as the sternum for its entire width and from the clavicular joint to the attachment of the fifth costal cartilage. Attached to the sternum and removed with it was a mediastinal tumor the size of a walnut. Considerable fatty tissue of the mediastinum was taken with the tumor, the dissection exposing the aorta. No serious symptoms resulted from the acute pneumothorax on the right side as the left lung in spite of the pleural adhesions and lessened mobility of the chest wall resulting from the previous operations gave sufficient breathing tissue. The wound was closed by a transplanted skin flap and the patient made a rapid recovery, leaving the hospital on the 18th day.

CASE V.—*Sarcoma of Clavicle involving First Rib and Sternum, with Large Mediastinal Tumor; Resection; Recovery, Patient being Well and Strong at the Present Time, Eleven Months after the Operation.*

W. H. H., aged seventy years, teamster, presented a large tumor at the base of the neck on the left side, fixed to and probably originating in the clavicle. Two years before he had injured the collar-bone, and three or four months afterwards noticed a small tumor near the inner end of the clavicle. The tumor continued to enlarge till it reached the size of about 10 x 15 x 8 centimetres, the long diameter being vertical. It covered the sternoclavicular joint and extended well up on the neck and over the upper chest. The skin contained many dilated veins, but was movable over the tumor, which was smooth in general outline, though coarsely lobed. Patient's general physical condition was excellent.

On August 16, 1904, under chloroform, the skin was incised, the edge stripped back, and the clavicle exposed and cut at the junction of its middle and outer third. The greater pectoral was cut across and the sternocleidomastoid divided about its middle. The clavicle was then tilted upward and the subclavius muscle divided. The first rib was then cut at a point internal to the subclavian vein without opening the pleura, the intercostal muscles cut, and the whole mass turned inward. A large lobe of the tumor the size of a hen's egg projected beneath the sternoclavicular joint into the mediastinum. In dissecting the subclavian vein from the tumor it was punctured near its point of union with the internal jugular. A little air entered, but compression with a gauze pledget sufficed to close the opening during the dissection.

In order to complete the separation of the vessels from the tumor the under side of the ligated external jugular was used as a guide and answered admirably. The internal mammary artery was not adherent to the tumor, but was lifted off it with the parietal pleura.

Because of the great depth to which the mediastinal lobe of the tumor extended, the uncertainty as to the quantity and character of adhesions of this lobe to the important structures of the mediastinum and the great difficulty of dissecting beneath so large a tumor, it was impracticable to complete the operation without dividing the tumor. Accordingly, the greater mass of the tumor was torn across and then section of the sternum was made with bone shears. The remainder of the tumor was then removed without difficulty.

While the pleura was not opened in this operation, the upper portion of the pleural sac was so widely freed from its parietal attachments that there was almost as much interference with the respiration as if the pleura had been opened and the bulging of the pleura into the wound with every expiration was annoying.

Whenever the pressure on the subclavian vein was released air would enter, and this occurred four or five times, but the quantity was small and it seemed to make no difference with the patient's breathing or pulse. The opening was finally closed with fine silk suture and fortified by a flap of fascia stitched over the suture line. The thoracic duct was not injured, as it probably would have been had not the external jugular been used as a guide and all the dissection carried on in front of it.

The wound was closed with drainage. Patient made a rapid recovery, being out of bed on the seventh day and leaving the hospital on the twelfth day.

At the present time (July 1), eleven months after operation, patient is continuing at his work as teamster, and his physician writes that he is well, having withstood an attack of grippe which tried his lung and shoulder in the coughing. There is no sign of recurrence as yet. Histologically, the tumor was an endothelioma.

In recapitulation, the writer would hazard the opinion that, although, to quote Watson Cheyne, " The patient's chance is in the first operation," there is still some chance for a certain proportion of cases with recurrence in sufficiently radical resection of the chest wall. Recurrences of the sort indicated are apt to be developed from remnants of the original tumor and

may in themselves be purely local. Radical dissection of the axilla is frequently followed by freedom of recurrence in that region because of the interruption of the process of metastasis by the lymph-glands. May not, in certain cases, the same thing be true of removal of infected lymph-glands of the chest wall and anterior mediastinum?

The artificial pneumothorax, if unilateral, presents no dangers sufficient to constitute contra-indication to the operation in patients well enough otherwise to warrant operation. The fatiguing respiratory efforts which supervene when the chest is opened may be almost entirely done away with by the use of a wet towel, covering the opening during the dissection.

As for results, it may be stated that of the six operations (including that of the sarcoma) there was no mortality, although most of the patients were well along in years, the ages at the time of the resections being 40, 46, 54, 68, and 70, with average of 55, and all except the sarcoma case having undergone radical Halsted operation, three cases within a year, the fourth within two years.

Of the four cases of recurrent carcinoma, one is dead four months after the operation (the tumor in this case was one of more than ordinary malignancy and rapidity of growth); one had further recurrence in the mediastinum after eight months, which disappeared under the X-ray but reappeared five months later, though patient is still living twenty months after the operation and twenty-eight months after the original Halsted operation; one had further recurrence in the next lower intercostal space for which a second resection was done in January last and is at present, six months later, free from recurrence, eleven months after the first resection and twenty-two months after the Halsted operation, and, finally, one is free from recurrence two years since the resection. (Case of Dr. Stillman.)

It is fair to state that in all of these cases but one, life has been prolonged, but it is still too soon, of course, to say whether any of the three cases which are to-day free from recurrence will remain so.

NON-PARASITIC CYSTS OF THE SPLEEN.[1]

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OUR knowledge of this subject has a twofold origin: First, the few and comparatively recent clinical reports; and, second, the somewhat more numerous accidental autopsy findings. The results of these two sources of information do not seem to agree, and, as will be seen later, it by no means follows that the two are intimately related, for the discovery, *post-mortem*, of a number of small, latent, cystic formations in a spleen does not seem to necessarily bear on the fact that in certain rare cases patients suffer during life with a formidable hæmatoma which originates in the spleen and demands surgical relief.

Up to 1904 the subject was practically ignored by writers, but that year witnessed the publication of not less than three monographic articles, each written in ignorance of the efforts of the other authors. These articles are by Heinricius (*Arch. f. klin. Chirurgie*, 1904, lxxii, 138); Monnier (*Beiträge z. klin. Chirurgie*, xli), and Laspeyres (*Centralblatt f. d. Grenzgeb. d. Med. u. Chirurgie*, 1904). Heinricius's article is the most comprehensive, as it deals with both clinical and autopsy material. Monnier's paper has to do only with splenectomy cases. Laspeyres devotes a section to the latter in a monographic article on splenectomy in general. The writer presents the subject at this time, first, because he has notes of an unreported personal case, and, second, because, so far as he knows, the matter has not yet received attention in English or American literature. In addition to the author's case, two others are added which seem to have been overlooked by other

[1] Read before the American Surgical Association, San Francisco, July, 1905.

writers, the total being thirty-two. This number by no means represents the frequency of the disease, for Heinricius cites numerous bare statistics of splenectomies in various clinics which show that this operation has been done a number of times for non-parasitic cysts, although no details are forthcoming. Of the chance autopsy findings collected by the same author, possibly half a dozen were large unilocular hæmatomata which, for some reason, never came to operation. So we may assume that from fifty to sixty of these large cysts have been known to exist; this number might perhaps be increased by correspondence. However, the condition is at best rare, and it may have lost some of its clinical interest from the conclusion reached by authors that it merely represents an indication for splenectomy, an operation the safety of which improves steadily from year to year.

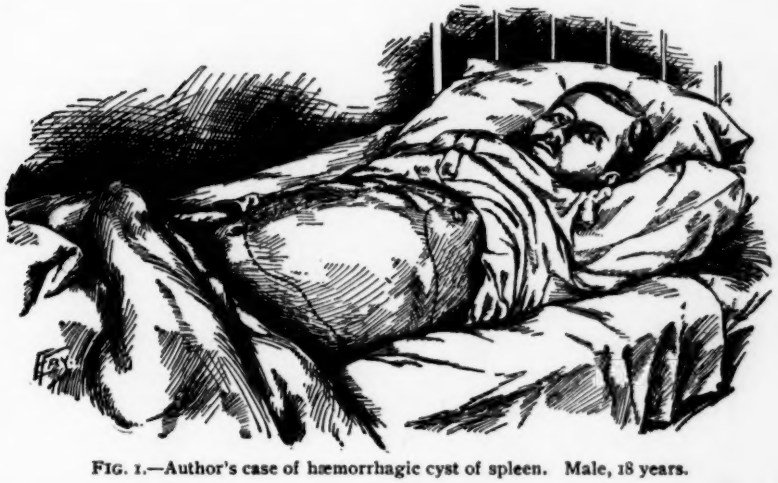

FIG. 1.—Author's case of hæmorrhagic cyst of spleen. Male, 18 years.

In this paper the author will first relate his own case, and then append a brief table of thirty-one other observations, endeavoring to analyze these as they stand.

AUTHOR'S CASE.—In September, 1895, Dr. H. M. Ogilbee, of Manitou, Colorado, kindly referred a young man of eighteen years, who presented a large, left-sided, abdominal cyst (Fig. 1). The mass was of four years' growth; there had been gradual

loss of flesh and strength, anorexia, headache, and general pressure symptoms. Fluctuation was plain. The diagnosis of splenic cyst seemed positive. *Operation.*—St. Luke's Hospital. A free incision was made over the prominent part of the tumor, the walls of which were found to be about one-half of an inch thick, semicartilaginous, and solidly adherent to all adjacent structures. Extirpation seemed impossible. (Later autopsy findings confirmed this.) The single cyst held several litres. Posterior incision, through drainage.

The walls of the cyst did not collapse, and the patient died of septic absorption from the cyst wall on the twelfth day. Autopsy with microscopic examination by Dr. H. C. Crouch, Professor of Pathology in the University of Colorado. Anatomical diagnosis, hæmorrhagic cyst of spleen. From the autopsy findings, the author could not see, as said, how the cyst could have been successfully extirpated.

TABLE OF CASES.

No.	Operator. Reference.	Sex. Age.	Clinical History.	Symptoms.	Treatment.	Result.	Character of Cyst.
1	Péan. Des tumeurs de l'abdomen, i, 1880.	F. 7	.....	.....	First recorded operation, 1863. Opening with caustic and injection of iodine.	Death from peritonitis two months later.	Serosanguineous cyst.
2	Péan. (Ibid.)	F. 20	Swelling and pain for two years with recent exacerbation.	Fixed, very painful tumor, fluctuating in places. Diagnosis of ovarian cyst.	Second recorded operation, 1867. Laparotomy followed by recognition of splenic cyst, which, having a pedicle, was readily extirpated after emptying it by puncture and dividing its adhesions.	Recovery. Patient in good health two years later.	Unilocular cyst springing from spleen. Capacity, three litres. Contents, hæmorrhagic.
3	Péan. (Ibid.)	F. 54	.....	Diagnosis of abdominal cyst.	Operation, 1879. Opening with caustic followed by incision.	Death in a few days from peritonitis.	Serosanguineous cyst.
4	Marcano and Féréal, Progrés Méd., 1874, p. 262.	M. 38	.....	Diagnosis of malaria with abdominal cyst.	Third recorded operation, 1874. Opening with caustic followed by puncture and use of retention-cannula.	Recovery, with persistence of small fistula three months later.	Serosanguineous cyst.
5	Credé. Arch. f. klin. Chirurgie, 1883, xxviii, p. 401.	M. 44	Tumor first noticed one year ago. Enlarged slowly; latterly more rapidly.	Tumor size of child's head, slightly tender, fluctuating. Pedicle to left and above. Covered by omentum and intestines. Diagnosis, hydronephrosis or cyst of spleen.	Laparotomy, September 25, 1881. Isolation of tumor and evacuation by puncture. Pedicle very short, spleen adherent. Splenectomy. Pedicle buried, wound closed.	Recovery complete after ten and a half months.	Cyst grew from lower half of spleen; contained 1350 cubic centimetres yellow fluid, but slightly albuminous.
6	Thornton. Medico-Chirurgical Transactions, 1886, lix, p. 407.	F. 19	First noticed two years ago.	Movable, fluctuating mass.	Laparotomy, 1884, and recognition of cyst of spleen. Adhesions divided and spleen extirpated.	Recovery.	One large and several smaller cysts, serosanguineous.
7	Spencer Wells. Brit. Med. Jour., 1889, ii, p. 66.	F. 21	Malarial splenomegaly since childhood. Two years ago tumor noted in ovarian region. Subsequent pregnancy (normal), followed by increase in size of tumor and secondary peritonitis.	As suggested by foregoing. Exploratory puncture; evacuation of five litres bloody fluid. Rapid reappearance.	Laparotomy, May 17, 1888. Cyst ruptured, and four or five litres of fluid escaped. Numerous splenic adhesions detached. Resection of cyst wall in part. Drainage.	Recovery. One year later patient well.	.....
8	Fink. Zeitschrift f. Heilkunde, 1890, x, p. 353.	M. 14	Rapidly growing tumor, left upper abdominal region.	Tumor extending from ribs to a hand's-breadth below navel. Nodular, soft, elastic, fluctuating, mobile. Diagnosis of splenic cyst.	Laparotomy, November 10, 1888. Tumor size of child's head, occupying lower half of otherwise normal spleen, resected with thermocautery.	Recovery. Patient well six months later.	Serosanguineous cyst of 1500 cubic centimetres capacity.

TABLE OF CASES.—*Continued.*

No.	Operator. Reference.	Sex. Age.	Clinical History.	Symptoms.	Treatment.	Result.	Character of Cyst.
9	Bardenheuer. Deutsch. Med. Wochenschrift, 1890, No. 36.	F. 47	.....	Tumor size of child's head, adherent to lesser pelvis. Pain in left side of abdomen. Notable digestive disturbances.	Laparotomy and extirpation of splenic cyst.	Recovery.	Cystic contents thin, and of a dirty, chocolate brown color. Cyst walls fibrous.
10	Terrier, Bull. et Mém. Soc. de Chirurgie, 1892, p. 661.	F. 33	First noticed pain in left side, followed by appearance of tumor.	Tumor at level of umbilicus, size of fist, fully movable, with pedicle. Diagnosis, cyst of omentum or spleen, probably hydatid.	Laparotomy, November 16, 1891. Recognition of splenic cyst, which was punctured and then extirpated.	Recovery. One year later spleen slightly enlarged and tender.	Cyst grew from concavity of spleen. Contained blood.
11	Schalita. Arch. f. klin. Chirurgie, 1895, xlix, p. 629.	F. 36	Ill for past two years. Tumor noticed five months ago. Pressure-symptoms.	Smooth, painless, fluctuating mass, movable below. Absence of hydatid thrill and friction murmur. Diagnosis of hydatid or splenic cyst.	Laparotomy. Extensive adhesions of spleen. Extirpation of spleen after examination of eight litres of fluid and divisions of many adhesions.	Recovery complete.	Spleen nearly transformed into a large serosanguineous cyst.
12	Moreschi and Ghetti. Gaz. degli Osped., 1896, No. 119.	F. 42	Direct violence followed by painful swelling, increasing rapidly in size.	Examined a month after supervention of symptoms. Diagnosis of enlarged and floating spleen.	Laparotomy, August 14, 1896. Splenectomy after division of adhesions with colon.	Recovery.	Serosanguineous cyst on anterior surface of spleen.
13	Baccelli. Il Policlinico, 1897, No. 6.	F. 27	Direct violence. Two months later, tumor noticed in left hypochondrium, slowly increasing in size.	Smooth, soft, elastic, and fluctuating mass, attached to lower border of spleen. Movable, and but little sensitive.	Tumor twice punctured, with escape of pure blood. Did not refill.	Recovery. One month later small swelling still perceptible.	Probably a subcapsular hæmorrhage of slow development, which disappeared when an outlet was furnished.
14	Heurtaux. Bull. et Mém. Soc. Chirurgie (Paris), 1898, p. 928.	F. 27	One year ago noticed tumor, which steadily increased in size.	Large, fluctuating mass occupying three-fourths of abdominal cavity.	Laparotomy. Cyst incised and washed out, then marsupialized.	Suppuration for a year. Injections of iodoform, etc. Recovery after lumbar counter-opening and drainage.	Capacity of cyst, 10 litres; contents, bloody, chocolate colored fluid.
15	Baginsky. Berl. klin. Wochenschrift, 1898, No. 2.	F. 12	Swelling of left side shortly after violent fall.	In left hypochondrium, an elastic, fluctuating mass extending across median line. Exploratory puncture, diagnosis of hæmorrhagic cyst of spleen.	Operation, May 3, 1896, by Professor Glück. Cyst sutured to peritoneum and skin. An elliptical piece excised from cyst wall. Evacuation of two litres of fluid, cyst cavity tamponed.	Recovery (radical cure, in sixteen weeks.	Excised piece of cyst wall showed some normal splenic tissue.
16	Michailowsky. XIII Internat. Congrés, Paris, 1900.	.. ..	Malarial splenomegaly. Trauma.	Traumatic blood cyst of spleen.	Splenectomy.	Recovery.	.....

17	Subbotic. Deutsch. Zeitsch. f. Chirurgie, 1900, liv, p. 487.	F. 40	.....	Malarial splenomegaly, perisplenitis, floating spleen.	Splenectomy for splenomegaly, 1897.	Recovery.	Spleen also seat of small multiple cysts, some serous, others hæmorrhagic.
18	Subbotic. (Ibid.)	M. 30	.....	Tumor size man's fist beneath left costal arch. Diagnosis, echinococcus or blood cyst of spleen.	Operation of incision and drainage, 1892. Parietal peritoneum adherent to wall of tumor. Evacuation of 1500 cubic centimetres of bloody fluid and clots. Peritoneum not opened.	Recovery, with small fistula.	Hæmorrhagic perisplenic cyst, from subcapsular hæmorrhage. Eventual adherence to peritoneum.
19	Subbotic. (Ibid.)	F. 21	.....	Tumor larger than a man's fist beneath left costal arch. Adherent to peritoneum.	Incision and drainage, 1897. Escape of two litres of bloody fluid. Clots also in cyst.	Recovery.	Hæmorrhagic perisplenic cyst. Correct diagnosis before operation.
20	Subbotic. (Ibid.)	F. 30	.....	Diagnosis of chronic splenomegaly, with lymphatic cyst at hilus of spleen.	Splenectomy, 1898.	Recovery.	Cyst size of hen's egg close to pedicle of spleen; cavity traversed by septa, wall continuous, with splenic capsule.
21	Leonte. Cited by Heinricius. See No. 29.	F. 55	.....	Tumor in pit of stomach. Diagnosis, cyst of gastrosplenic ligament.	Splenectomy. Lesion found to be unilocular cyst of spleen with almost complete atrophy of latter.	(?)	.....
22	Reimann. "Ueber Milzcystem," Diss. Leipzig, 1901.	M. 33	.....	Spleen enlarged and irregular in form and consistence. Pressure symptoms upward. Trial puncture brought away old hæmorrhagic fluid.	Operative puncture at repeated intervals. No improvement. Radical operation refused.	No benefit.	Serosanguineous cyst.
23	Routier. XIV Congrés de Chirurgie, Paris, 1901, p. 157.	F. 24	Tumor first noted nine years ago. Gradually increased in size. One year ago began to grow more rapidly.	Resembled floating spleen until after rapid increase.	Splenectomy, February 5, 1901.	Recovery.	Splenic tumor occupied lower half of organ, upper part being normal. Composed of multiple, organized hæmatomata.
24	Lejars. XIV Congrés de Chirurgie, Paris, 1901, p. 158.	F. 43	Tumor first noticed about a year before. Previous history of trauma and severe abdominal disturbances extending over months.	Tumor in splenic area tapped from behind and in front, with evacuation of old hæmorrhagic fluid. Supervention of symptoms of infection led to intervention.	Operative lumbar incision on January 3, 1901. Escape of one and a half litres of dark, bloody fluid. Sac washed out and drained. Extended iliac crest, lumbar region, and navel.	Recovery.	Probable subcapsular hæmorrhage of spleen, with resulting perisplenitis.
25	Dalinger. Medicin. Obosrenija, Der., 1901.	M. 44	Malaria for a year, with very recent acute exacerbation; confined to bed; collapse.	High temperature. Increased splenic dulness.	Splenectomy.	Recovery.	Subcapsular hæmorrhage of spleen; capsular adhesions. Splenic tissues softened. Blood, partly liquid and partly clotted, was present in the cyst.

TABLE OF CASES.—*Concluded.*

No.	Operator. Reference.	Sex. Age.	Clinical History.	Symptoms.	Treatment.	Result.	Character of Cyst.
26	Chavier. Bulletin Méd., 1902, xvi, p. 24.	M. ..	Many years before had had a hurt over spleen. Subsequent digestive disturbances. Recent acute exacerbation, violent pain, tympanites.	Diagnosis of intestinal occlusion.	No operation.	Death in two days.	Autopsy showed tumor of spleen, non-adherent. Represented a subcapsular hæmatoma with consecutive atrophy of spleen. Tumor much larger than spleen. Death from rupture of stomach.
27	Jordan. Centralb. d. Chirurgie, 1903, No. 36.	F. 46	.....	.....	Splenectomy, 1899.	Recovery.	Blood cyst of spleen.
28	Monnier. Beiträge z. klin. Chirurgie, xli, 1903–4, p. 181.	F. 21	Recently, with good previous history, local and general symptoms and beginning tumor in left hypochondrium.	Bulging in left hypochondrium. Tumor moved on respiration with rough friction-murmur. Appeared to be a cyst; not tender, and some movable.	Operation, June 12, 1903, by Professor Krönlein. Cyst of upper part of spleen, adherent to surrounding tissues. Puncture brought away bloody fluid. Splenectomy after division of adhesions.	Recovery.	Capacity of cyst, three and a half litres.
29	Heinricius. Arch. f. Klin. Chirurgie, 1904, lxxii, p. 138.	F. 14	Tumor noted shortly before operation. General health good.	Mass reached nearly to pubes. Smooth, tense, freely movable. Uterus and ovaries normal.	Operation, March 21, 1900. Spleen found displaced downward, and twisted on pedicle, with tumor growing from outer portion. Splenectomy.	Recovery. Patient well three years later.	Splenic tumor, cystic; capacity, 800 cubic centimetres, size of child's head; contents, hæmorrhagic. Grew from outer lower portion.
30	Powers.	M. 18	Tumor had been growing for four years.	General failure of health; pressure symptoms.	Operation, September, 1895. Incision. Tumor universally adherent. Freely opened, evacuated, and drained. Walls were thick and semi-cartilaginous, and did not collapse.	Death on twelfth day, from sepsis due to absorption from cyst wall.	Unilocular cyst.
31	Leonte. XIV Congrés Chirurgie, Paris, 1901.	F. ..	.....	.....	Both cases operated on by marsupialization.	Both recovered.	Both unilocular, serosanguineouos cysts of spleen; capacity, 1400–2000 cubic centimetres.
32		F. ..	.....	.....			

BRIEF ANALYSIS OF THIRTY-TWO TABULATED CASES.

Etiology.—These thirty-two cases represent the known clinical material which has been under observation during life. In all but one (Michailowsky) the sex is given, viz., male 8, female 23. In twenty-one female cases the ages are given; and we learn that the very great majority (eighteen) occurred during the menstrual years; at least sixteen in the childbearing period. Making due allowance for the influence of injuries and diseases of the spleen, and for the fact that in some instances the cysts were a long time in developing, there seems no reason to doubt that these occur often enough in women during the reproductive cycle to give the affection a gynæcological bias. If we study the cases discovered in chance autopsies, the data, while scanty, do not appear to show this; so that we are perhaps justified in regarding menstruation and parturition as merely aggravating causes. In a few instances the cyst became much enlarged by childbirth, and perhaps full particulars of the history—which details are often wanting—would increase the number.

Aside from the teachings furnished by sex and age the meagreness of many case-histories renders further data as to causation of limited significance. Traumatism and antecedent disease of the spleen (specially malarial enlargement) undoubtedly act as contributory causes in not a few cases; in as many others, however, such factors are wanting. Whatever the original cause, we often find recorded an acute exacerbation which brings the patient under medical observation. Aside from childbirth, we know nothing of the causes of such exacerbations.

Symptoms.—After the cases came under medical observation, the cystic character of the tumor seems to have been generally recognized, although in a few cases the diagnosis—rightfully or wrongfully made—of an enlarged or floating spleen is recorded.

Diagnosis.—The precise diagnosis, both as to origin and character of the cyst, was seldom made, although in some cases

it was recorded as a possibility; that is, it was noted as one member of an alternative.

Treatment.—When we come to treatment, we find that of the thirty-two cases one died of intercurrent rupture of the stomach before operation could take place (Chavier). In two of Subbotic's cases the spleen was really removed for chronic hypertrophy, and the discovery of complicating cystic formations was simply accidental. Finally, in one of Leonte's cases (No. 21), not accessible at first hand, the reviewer (Heinricius) omits to state the result of the operation (splenectomy), although we have every reason to believe that it was successful. This leaves twenty-eight cases for consideration. Analyzing these, we find that the patients have been treated as follows: simple puncture, 3; incision and injection, 2; incision and drainage, 5; marsupialization, 3; extirpation of cyst, 5; extirpation of spleen, 10.

Puncture.—Of the three cases (4, 13, 22) of puncture (Marcano and Féréal, Baccelli, Reimann), in the first of which a retention-cannula was used, two patients made a relative recovery. In one a fistula remained, and in another complete resolution did not occur. The third was merely a case of palliative tapping, and no improvement resulted.

Incision (and Injection).—The two cases (1, 3) thus treated were among the earliest recorded (Pean). Both patients died of peritonitis; the first after a course of iodine injections, the second soon after incision, probably anticipating injection treatment.

Incision and Drainage.—(This method includes tamponade.) Of five cases (15, 18, 19, 24, 30) thus treated, three made complete recovery, and a fourth a relative recovery (persistence of small fistula). The fifth patient (author's case) died of sepsis.

Marsupialization.—Three cases (14, 31, 32) treated in this manner made good recoveries.

Resection of Cyst.—This operation was performed five times (Cases 2, 7, 8, 9, 10), and varied with the nature of the cyst. If a pedicle was present, the latter was readily tied

off, otherwise the extirpation was effected as thoroughly as practicable. It is worthy of note that all of these operations were done at an early date (none subsequent to 1892). Four patients made complete recovery. The fifth, Terrier's case, made a relative recovery, the spleen being slightly enlarged and tender a year after operation.

Splenectomy.—There were ten cases (5, 6, 11, 12, 16, 23, 25, 27, 28, 29) of this operation (we do not include two cases of splenectomy by Subbotic in which the operation was really done for chronic enlargement), and all recovered.

A comparison of these methods appears to show that puncture, incision, and drainage, and resection of the cyst proper, while able to secure permanent recovery in selected cases, are nevertheless untrustworthy, each having failed (in a part of a small series of cases) to produce cure, while several fatalities have resulted. Although marsupialization has a clean record in a small number of cases, it is manifestly restricted to those in which the integrity of the spleen is not compromised. On the other hand, splenectomy appears to be the only operation of general applicability, and to be a necessity whenever the spleen is extensively affected, either by pre-existing disease, or by displacement, or by atrophy due to the compression of large cysts, etc. We must bear in mind that the conservative operations are, as a rule, of relatively earlier date than the radical, and were employed largely in the thought that total ablation was fraught with great danger to the system at large. Those who first removed the spleen for this condition seem to have been very anxious as to the state of the blood count, thyroid, and bone-marrow.

Pathology and Nature.—Not very much is to be learned from an analysis of the clinical material as to the actual nature of these cysts, most of the speculation as to the origin and dvelopment of the formations being based upon autopsy cases in which the cysts are small and latent. As has been observed, it is a long distance from the latter findings to cysts of surgical importance; and it is difficult to show a direct transition from the one to the other. Indeed, they may represent two

entirely independent conditions. The autopsy cyst is of common occurrence; one pathologist may encounter many cases in a lifetime. The clinically important cyst, on the contrary, is very rare, and few surgeons encounter more than one or two in an entire experience.

Clinical observation, however, teaches us these truths,—nearly all of the cysts which come to treatment are large and unilocular, and of the serosanguineous type. They contain from one to ten litres of fresh or old blood, and the greater the age of the cyst the greater the secondary alterations resulting from absorption of the fluid portion, decomposition of coloring matter, and persistence of organized fibrin, cholesterin, mineral matter, etc. The walls of the cyst consist of a varying proportion of splenic and fibrous tissue with corresponding variations in the thickness.

Without going into speculation based upon histological studies of small cysts found accidentally at autopsy, it seems safe to say that the typical cyst of the spleen, from the purely surgical stand-point, originates in a subcapsular hæmorrhage of whatsoever origin. This is especially true of the cases reported during the last ten or twelve years. We find a consensus of data which shows that the slight, continuous escape of blood beneath the capsule—never severe enough to present symptoms of internal hæmorrhage—causes a hæmatoma; and that the peritoneal capsule undergoes a low form of inflammation which almost invariably results in adhesion to the outlying tissues. If the tumor is of sufficient size, pressure symptoms result which may affect the thorax or abdomen, according to locality. If the peritoneal reaction is sufficiently intense, pain, vomiting, etc., may come on. If the pressure is exerted upon the spleen itself, the organ undergoes atrophy in time.

But although this seems to be the predominant form of splenic cyst, and one which is very sharply characterized, it by no means represents all the possibilities of the lesion. There are other cases in which the hæmorrhage cannot be regarded as subcapsular, but must be thought parenchymatous. The former has a free field in burrowing between the spleen and its

capsule, in accumulating in large amounts, and in causing perisplenic adhesions and pressure symptoms. The latter is deeper seated, smaller, and more localized, originating probably from rupture of a splenic blood-vessel. Its walls are composed originally of normal splenic tissue, which in time becomes transformed in part into simple fibrous tissue. While it tends to come to the surface of the spleen, the pressure symptoms and the peritoneal adhesions are much less in evidence. The difference between the two types is essentially one of degree. The contents of these cysts are the same, and under certain circumstances the two may produce in time the same clinical picture. Generally speaking, however, the parenchymatous variety is more strictly isolated, and is localized in a particular region of the spleen, the remainder of the organ being intact. It has even happened that these cysts have formed pedicles or have developed sessile attachments to a spleen otherwise normal. Hence it is not surprising, bearing in mind the former fear of extirpating the entire spleen, that the earlier operators employed conservative measures in dealing with these cysts, especially when they were clearly circumscribed. Nor can we, even at this time, deny that such sharply localized cysts are best treated conservatively in selected cases, especially when the cyst is pedunculated.

Non-hæmorrhagic cysts are of such rare occurrence clinically that they may be left out of consideration.

Some of the more recent writers, in view of the frequent complication of perisplenitis, are calling attention to the diagnostic value of a perisplenitic friction sound, which is synchronous with respiration. Such diagnostic evidence, while obtainable in certain cases, seems to the writer of doubtful value.

Heinricius states that the hæmatoma is readily distinguished from all other cysts as to origin and nature. It must be due either to rupture of a healthy vessel by trauma, or of a diseased vessel either spontaneous or traumatic. Probably as a result of the study of autopsy material, he adds that such ruptures may occur in connection with tumor formation (doubtless meaning angiomata). These blood cysts differ in

no wise from hæmatomata in other localities. Heinricius appears to have overlooked the fact that the typical hæmatoma is subperitoneal or subcapsular, with an almost inevitable tendency to cause adhesions; at least, he speaks of the process as though it were essentially intrasplenic.

In regard to the evolution and symptoms of large cysts, Heinricius states that they most often grow in the direction of least resistance, *i.e.*, downward and forward; yet he admits that in some cases the pressure is exerted towards the diaphragm. The relation of the growing cyst to the surrounding viscera and to local and general symptoms is not explained. Generally speaking, the tumor is of irregular contour, fluctuating in places, and rather insensitive. The rate of growth may be very variable. His statement that the cysts may rupture or suppurate does not seem to be borne out by facts.

Diagnosis must, as a rule, be made by exclusion alone. In addition to sources of confusion already cited, pleural effusion, cyst of the right lobe of the liver, and abscess of the abdominal wall may be added.

The patient's account of his own case possesses considerable value. Exploratory puncture can throw but little light on the origin of the tumor.

The operation almost invariably indicated is splenectomy, which is only contraindicated by extensive adhesions and extreme cachexia. Extirpation of the cyst is practicable only when a pedicle is present. Other interventions are condemned. They are essentially palliative and, moreover, dangerous.

Monnier explains the predominance of female patients in the reproductive cycle by the fact that the spleen becomes hyperæmic and relaxes during menstruation, pregnancy, and menopause. He thinks small latent cysts may become hæmorrhagic, but admits that no one has demonstrated a connecting link between them and the large hæmatomata. The blood count is of no value in diagnosis, since it undergoes no change. He is inclined to believe that the perisplenitic friction sound has a limited diagnostic value, even if it only serves to exclude the possibility of extraperitoneal tumors.

PERFORATION OF THE GALL-BLADDER.

WITH A REPORT OF TEN CASES.

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GALL-BLADDER perforations are comparatively rare, especially if we confine our observations to ruptures due to violence, ulceration, and gangrenous inflammations. But if we add to these the cases of cholecystitis in which inflammatory products have evidently escaped from or passed through the wall of an inflamed gall-bladder, even though we may not find the perforation itself, the number of cases is considerably increased.

When an abscess forms about an inflamed appendix, we speak of it as due to a perforation of the appendix. Such abscesses about the gall-bladder, either in the free peritoneal cavity or in the neighboring liver tissues, are rare as compared with appendiceal abscesses, but are not uncommon, and unquestionably should be included when studying perforations of the gall-bladder.

Fistulous passages between the gall-bladder and duodenum, stomach, or colon, are, of course, due to perforation of the gall-bladder, and usually to the ulceration through the visceral walls of a large gall-stone. Large-sized stones always pass in this way instead of through the ampulla. (Mayo.)

Most perforations of the gall-bladder occur in neglected cases where gall-stones have been known to exist for long periods of time, and where the patient has had ample warning through many attacks of biliary colic. In such a patient, a secondary cholecystitis or an attack of typhoid fever brings the added risk of perforation of the gall-bladder, producing either septic peritonitis or a localized abscess.

In the medical literature of to-day we find a few reports of single perforation cases, and Drs. Erdmann and Keen, in the ANNALS OF SURGERY some two years ago, collected thirty-four cases of primary typhoidal perforations. Of this number seven were operated upon, with four recoveries. Of the twenty-seven not operated upon, all died.

We may approximate the percentage of perforative cases by a careful study of Robson's 539 operations on the gall-bladder and bile ducts published in December, 1903. In the text he only speaks of five perforative cases; but if we carefully read the detailed histories of all of his reported cases, we will find that twenty-five of these cases can be fairly said to be perforative in character, or a percentage of .046 per cent. In his first 270 cases only seven are of this character, while in the last 270, eighteen, or .066 per cent. Of this number there are three cases of general peritonitis due to rupture of the gall-bladder; ten intraperitoneal abscesses, most of them containing gall-stones and usually situated between the gall-bladder and the duodenum; one in the head of the pancreas, containing a single gall-stone; several abscesses containing gall-stones; four fistulæ, three between the gall-bladder and the duodenum and one between the gall-bladder and colon. And there was one case where a gall-stone was found one-half in and one-half outside of the gall-bladder, still plugging the opening. Of these twenty-five cases there were five deaths, or a mortality of 25 per cent.

The Drs. W. J. and C. H. Mayo, in 328 cases operated upon between June, 1901, and February, 1902, at St. Mary's Hospital, found thirteen cases where gall-stones were lying in pockets outside of the gall-bladder. There were two subcutaneous abscesses containing gall-stones, and one case in which such abscess had ruptured, leaving a fistula discharging pus and gall-stones, a total of sixteen cases. Dr. A. J. Ochsner, in the forty-eight cases operated upon at the Augustine Hospital in 1901, had one perforation; fourteen gall-stones were found in an abscess in the anterior abdominal wall. Single perforative cases from gangrene of the

gall-bladder are reported by Hotchkiss, Mayo, Robson, and Gibbon.

Rupture of the gall-bladder from violence is rare, especially if in its normal state. Dr. John F. Thompson's and Dr. De Forest Willard's cases stand practically alone in this class. In the latter the child was crushed by a wagon-wheel, and two months later Dr. Willard found sixty-four ounces of encapsulated fluid which was almost all pure bile.

CASE I.—The first case of perforation of the gall-bladder that I ever saw was due to direct violence exerted upon an enlarged diseased gall-bladder. Major W. was a Civil War veteran, sixty years of age. He was supposed to have suffered from chronic malaria, for which trouble he was sent to Minnesota some twenty years ago. For many years he was a patient of Dr. William Pepper, of Philadelphia, and he had seen all of the leading medical men of the East on account of periodic enlargement of the "liver," which was never associated with marked colic or jaundice. I knew him as a friend and neighbor for many years, during at least ten years of his later life, when he was never seriously ill. As a result of a gunshot injury received in the service, he wore a wooden arm. Tripping, one day, on the street, he fell forward, with his arm bent under him so that the wooden fingers of the artificial arm pressed directly on his enlarged gall-bladder and caused it to rupture. I saw him forty-eight hours later in consultation, when an operation would have been of no avail. Later, I made a post-mortem examination and found a general septic peritonitis due to a perforation of a gall-bladder at least six inches in diameter, with very thick walls. The rent in the anterior wall of the gall-bladder would admit my finger. The gall-bladder contained over fifty large-sized old black stones and thirty-two ounces of thick pus; pus was also present in the peritoneal cavity.

CASE II.—Mrs. S.,(?) aged 35 years; seen with Dr. Beal, of West St. Paul; never had suffered from typhoid or jaundice; colic every other night for past two weeks, with evidence of upper peritonitis of a subacute character.

Operation, November 30, 1899; universal adhesions; a small, thick gall-bladder containing six medium-sized gall-stones. A hard nodule in the under surface of the liver was opened and found to contain a single gall-stone of the same size, color, and shape of the other six. This cavity and the gall-bladder were drained, and the woman promptly recovered.

CASE III.—Dr. De W., aged fifty years, U. S. A. First attack of colic fourteen years ago. One year before I saw him, while serving in the army in Cuba, he broke down, and was invalided home with a return of his attacks of colic. He first became aware of the existence of a tumor in the gall-bladder for weeks before consulting me. Just as all preparations had been made for an operation, the tumor suddenly disappeared, and the patient felt better. Later, he commenced to suffer with night pains, pleuritic in character, in the gall-bladder region, and ten days later the operation was performed. A small abscess between the colon and the perforated gall-bladder was found. There were no gall-stones either in the biliary passages or in the abscess, but a perforation as large as a lead-pencil was found on the anterior wall of the thickened gall-bladder. The gall-bladder was drained; it should have been removed, for a mucous fistula still exists, and the colonel is perfectly comfortable while it discharges, but very uncomfortable when it attempts to close.

CASE IV.—Mrs. J., seen with Dr. Jones, of Battle Lake, Minnesota. Patient was thirty-five years of age; had been sick and suffering with right hypochondriac pains for three weeks past. Universal adhesions were found binding the thickened, inflamed gall-bladder to the pylorus, duodenum, and colon. One large-sized gall-stone was found wedged into the cystic duct; the gall-bladder was filled with a thick, muddy, serous fluid. Under the gall-bladder was a small puddle of the same thick fluid, although no perforation could be found. Mrs. J. promptly recovered after drainage of the gall-bladder, and was well when last heard from, eighteen months after the operation.

CASE V.—Mr. A. was almost a full-blooded Indian, living in the Indian Territory. Taken sick while travelling through the North-West. He had been sick for three weeks with a hard, pain-

ful tumor just below the edge of the ribs on the right side. He had a constant temperature of about 101° F. and was slightly jaundiced.

At operation he was found to be suffering from gangrene of the gall-bladder and quadrate lobe. Drainage of the abscess with a tube was unsatisfactory, and he refused to be operated upon the second time. This patient died from sepsis eight days after the operation. Postmortem by Dr. Cameron, no gall-stones, but extensive gangrene of the gall-bladder and neighboring liver tissue.

CASE VI.—Mrs. C., sent by Dr. Charles Germo, Balaton, Minnesota; sixty-one years of age; thirty years ago had suffered for three or four years with biliary colic, the attacks coming every few months and frequently lasting two or three hours. After this time she had no abdominal distress for twenty years.

Of late there had been a return of her old trouble, which was now more constant and more intense in character. She was jaundiced, with clay-colored stools, frequent chills, and irregular temperature. At the operation the small contracted gall-bladder was found densely adherent to everything, especially to the duodenum, which showed a well-marked scar of an old perforation. Three stones were found in the common duct. Cholecystectomy and choledochotomy were followed by recovery, and seven months later she reports herself cured.

CASE VII.—Mr. B., aged twenty-five years; patient of Dr. Ramsey, of St. Paul. Last September I operated upon this young man for relapsing appendicitis during the interval, and removed a seven-inch appendix showing subacute inflammatory changes. Three days after the operation he developed a right lobar pneumonia, which resolved on the eighth day. He was perfectly well for two months, when he had an attack of cholecystitis; soon after he had an attack of obstruction, with marked impaction in the transverse colon, relieved on the tenth day. From this he quickly recovered and was well enough to be married. About two months after his marriage he had a second attack of cholecystitis, with persistent vomiting of bile. All nourishment was stopped by mouth, but still his vomiting continued; three or four times each day he vomited about six ounces of a deeply green fluid. Operation was postponed because of his good general appearance and pulse, which ranged about 80.

After he had been nourished and watered through the rectum for a month and was not able to retain even water, I operated upon him, and found a contracted gall-bladder adherent to all of the surrounding tissue, but no stones. A broad band of adhesions ran from the gall-bladder region down across both the duodenum and the transverse colon, markedly constricting them both. This was divided, and the gall-bladder was then removed. In removing the gall-bladder, I opened into an abscess of the liver, which contained three ounces of thick brownish pus just at the commencement of the cystic duct. Thinking that I had found the cause of all his trouble, I did not open the common duct, but stitched a tube into the stump of the cystic duct and drained the abscess cavity. He showed no bad effects from the operation; but his vomiting continued just the same, and, no bile being discharged from the drain, eight days later through a new opening I made a gastro-enterostomy by Mayo's latest method, when the patient immediately stopped vomiting, and is now perfectly well, having gained forty pounds in two months.

CASE VIII.—Mr. C., aged forty-five years; farmer; seen with Dr. H. Rees, of Maynard, Minnesota, at his own home, November 20, 1904. Patient had suffered from several distinct attacks of biliary colic, usually lasting for two to three hours. The last attack commenced two weeks ago and still continues. He has been very sick ever since, with a temperature ranging from 100° to 102° F., with frequent chills, slight jaundice, constant pain and tenderness, with some induration in the gall-bladder region. Operation in the farmhouse; opened an abscess which extended from the edge of the liver to the line of the umbilicus and contained a quart of bile-stained pus. The gall-bladder filled with stones could be felt in the upper wall of the abscess cavity; no attempt was made to demonstrate the perforation or to attempt to remove the stones at this time. The abscess was drained for four weeks, and the man slowly regained some flesh and strength; but he never felt well, and suffered some pain in the region of the liver, which was supposed to be due to gall-stones. On April 3, I operated upon him again at St. Luke's Hospital, St. Paul. I found a universally adherent, small, contracted gall-bladder containing thirty gall-stones and no bile. In attempting to explore the ducts, I found that the liver was

unusually fixed. In separating adhesions between the upper surface of the liver and the diaphragm, I unexpectedly put my finger into a large subdiaphragmatic abscess; without withdrawing the finger, I cut down upon and resected two inches of the seventh rib in the anterior axillary line, opened the free pleural cavity and tamponed the opening all around with a thick veil of iodoform gauze until all breathing sounds were stopped, then opened the abscess through the diaphragm and let out fully eight ounces of thick offensive pus; a counter-opening was made in the back and thorough drainage made with a rubber tube. This man made a slow recovery; seven days after the operation he discharged two gall-stones from the abscess. He left the hospital six weeks after his operation with his sinuses almost closed and steadily gaining in flesh.

CASE IX.—Mrs. C.; seen with Dr. Merrill, of Stillwater, Minnesota; aged thirty-two years; one child three weeks old; she had suffered a great deal of pain in the gall-bladder region during the last weeks of pregnancy. Jaundice and tumor appeared ten days ago. Exploration demonstrated an abscess adherent to the anterior wall containing fully six ounces of thick pus and six gall-stones. She left the hospital two weeks after the operation; the discharge continued for a few days, but was entirely stopped at the end of three weeks. There never has been any discharge of bile.

CASE X.—Miss C., aged thirty-two years; suffered from her first attack of colic in the fall of 1899. In December she developed typhoid; commenced having pain in the gall-bladder region during the fifth week. She steadily grew worse, and was taken to Rochester, where she was operated upon by Dr. W. Mayo, January 22, 1900. A large abscess was opened in the gall-bladder region, which in the next few days discharged five large and twenty small gall-stones. She left the hospital in about one month and remained well for about four years, when she suffered from a sharp attack of biliary colic.

One year later she had a second attack, which was more intense in character and lasted three days. About a month after this attack, February 17, 1905, I operated upon her, separated extensive adhesions to the gall-bladder and liver, and removed five old black stones from the gall-bladder and drained it. Bile

commenced flowing on the third day, and she soon recovered, and is now apparently quite well.

I have operated upon eighty gall-stones cases, nine of which were perforative in character, and one postmortem, making a total of ten, which seems to be a large proportion as compared with other lists of cases already on record. There were eight recoveries and one death. In this fatal case I believe that the result would have been the same even though the gall-bladder had been removed, because, with gangrene of the gall-bladder and the neighboring tissues, and especially in the presence of a localized abscess, any operative work which disturbed the abscess wall would only have spread the infection and lessened the chance of recovery. I believe that in any perforative case which has gone on to the formation of a localized abscess, the wisest course is to open and drain the abscess, waiting until a later time to deal with the gall-stones or the disease of the gall-bladder.

In perforative cases where the infection is not localized, then cholecystectomy with local, if necessary, drainage of the kidney pouch and the pelvic cavity with the Fowler position gives the patient the best chance of escape.

If these cases prove anything, it is that gall-stones should always be removed as soon as the diagnosis can be made, and in the interval, before complications have arisen to increase the danger and lessen the certainty of a perfect recovery.

THE VALUE AND PLACE OF DUODENOCHOLEDOCHOTOMY IN GALL-STONE SURGERY.

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DUODENOCHOLEDOCHOTOMY was devised to accomplish the removal of offending gall-stones in that part of the common duct included within, or adjacent to, the walls of the duodenum, more particularly to remove stones impacted in the diverticulum of Vater. In this class of cases and in neoplasm of the papilla and, more recently, in removal of pancreatic calculi this operation has a distinct place and meets the requirements satisfactorily.

McBurney[1] in 1891 devised and first performed this operation for a stone in the duodenal part of the common duct with recovery of stone and patient. In 1894, without knowledge on his part of McBurney's procedure, Kocher[2] employed the same route. Kehr,[3] independently of Kocher, performed the operation in 1894. Pozzi[4] in 1894 likewise performed the operation successfully. Robson[5] in 1897 did the operation probably for the first time in England. Up to the end of 1899, according to Kocher, the route had been employed twenty times with two deaths. To this number Thienhaus,[6] by collecting 8 cases and contributing his own, added 9. Besides these Robson[7] has reported 13 of his own cases and 1 of Dalziel.[8] Of these some and the one of Moynihan[9] were for pancreatic calculi, alone or with gall-stones. McBurney has done this operation in 11 cases, of which 9 are through his kindness reported for the first time by the author. W. J. Mayo has employed the operation 6 times, 4 times for stone and twice for neoplasm of the papilla. Of these 4 are herewith reported for the first time through his courtesy and 1 only is included in the statistics of Thienhaus. Kehr[10] more recently reports 3 cases, and to these enumerated the author adds another. From this it will appear that without duplication so far as

known 33 cases are herewith added to the 29 cases already reported, making a total of 62 cases. Twenty of these, or approximately one-third, were collected by Kocher [11] for the period 1891 to 1900. Since then 41, or more than twice as many, have been done in the last five years, showing that the operation has found its place among established procedures. In view of the impetus of recent advances in pancreatic work the operation will doubtless acquire increased importance and usefulness

Pantaloni [12] discriminates between lithotomia transduodenalis and choledochotomia transduodenalis. The former devised and performed by McBurney consists in approaching the stone in the common duct near the papilla through an incision in the anterior wall of the duodenum and removing the stone by incising the papilla. Collins modified the last step by dilating the papilla and removing the stone. Kocher's [13] operation of choledochotomia transduodenalis consists in immobilizing the stone in the duct between the fingers and after opening the duodenum, cutting directly down upon the stone through the duodeno-duct wall.

The scope of these procedures was originally confined to the removal of offending gall-stones from the lower end of the common duct, and of the series of 62 cases this was the purpose in 57 or approximately 92 per cent. Later it was made to extend to the relief of obstruction from neoplasm of the papilla. This was done in two cases or 3 per cent. More recently removal of pancreatic calculi by this route has been reported. Thus of the five cases of operation for pancreatic calculi collected by Robson and Clarke from the literature and reported by Robson [14] three at least were modified duodenocholedochotomies. Of the indications for the operation the obvious is obstruction from a gall-stone impacted in the diverticulum of Vater, neoplasm or stricture of the papilla, and pancreatic calculi in the diverticulum or at, and adjacent to, the orifice of the ducts of Wirsung and Santorini. Indications of convenience, rather than urgency are obstruction from a stone not actually in the

lowest part of the duct but more accessible via the duodenum than from without by virtue of adhesions; and occasions according to Robson,[15] " when the liver is small and the common duct cannot be made to reach the surface, its exposure through the duodenum may be simpler than the ordinary operation of choledochotomy." Zeller [16] cites an interesting case in which he failed at operation to detect a stone in the lower end of the common duct by palpation and found it at autopsy by passing a probe through the papilla. Since then he has practised sounding the end of the duct through the duodenum when the stone is not readily palpated and thinks the danger of infection is greatly overrated. W. J. Mayo [17] regards the operation as incomplete without a supra-duodenal-choledochotomy on the ground that the obstructing stone removed via the duodenum " may not be the largest present, and others may still remain in the duct;" therefore he recommends " the common duct should at the same time be opened, explored, and drained." That this step is necessary or even desirable in all cases does not appear from the records of reported cases in which it was not done. Drainage, of course, in such cases which represent the cumulative effects of chronic obstruction is important for the success of the work, and where the usually small and contracted gall bladder is not available for drainage purposes a supra-duodenal opening into the common duct may be desirable. In the author's case, which is not cited here to prove that drainage is not necessary in most cases, the gall-bladder was removed after tying the cystic duct and no provision was made for drainage beyond that of a dilated common duct orifice which passed bile freely as soon as the obstructing stone was removed. Moreover in regard to the size of the stone would it not usually be possible to recognize a larger stone in a location more favorable for recognition than a smaller one which had been recognized in a less favorable locality? A stone too large to be removed safely via the duodenal route should be removed by the supraduodenal way. Furthermore, duodenocholedochotomy as indicated above is preferred to supra-duodenal-choledochotomy in certain fixed

positions of the common duct as from adhesions or a small liver. In suitable cases supplemental supra-duodenal-choledochotomy ensures added thoroughness and effectiveness, especially when the procedure of drawing gauze strips through the duct between the upper incision in the duct and papillary orifice, as practised by Mayo and Kehr, is carried out.

In regard to the special technique incident to duodenocholedochotomy McBurney [18] lays stress on the following procedure: "In all cases which are not complicated by very deep adhesions involving the common duct and descending portion of the duodenum, it is easy and very desirable after determining the presence of a calculus in the lower part of the duct to pass the left forefinger through the foramen of Winslow to a point behind the calculus. With the finger the lower end of the common duct, the calculus, and the descending portion of the duodenum can be lifted forward so as to bring these parts nearly or quite to the level of the abdominal incision. The duodenum is then incised in its anterior wall for from one inch to one inch and a half, the orifice of the duct (which is usually markedly altered as to the color, etc.) is easily found and enlarged with knife or scissors or forceps, and the stone removed; all of this, and even the suture of the intestinal wound, should be completed without removing for a moment the left forefinger from its supporting position."

In choledochotomia-transduodenalis Kocher [19] advocates suture of the incision in the posterior duodenal wall when one can be sure that the opening of the papilla will not thereby be narrowed. Robson,[20] on the other hand, has found no need as a rule to suture the posterior duodenal wall. As pointed out by Kocher, however, this is only admissible when the incision has been strictly within the wall of the duodenum and does not extend upward, so as to allow the escape of infected bile into the space between the duct and duodenum. The higher the incision, therefore, the greater the need of suture.

The objections to the operation are based on technical difficulties and postoperative danger. The difficulty in finding the papilla is overestimated and is apparently based on dis-

secting room studies where the absence of pathological guides is probably responsible for erroneous conclusions. In operating in the presence of pathological conditions we have as aids pointing to the position of the papilla first the calculus supported on the left forefinger and second with the duodenum opened the thickening and discolored appearance of the papilla. Those who have actually done the operation regard this difficulty rather fancied than real. The other principal technical difficulty is the depth of the wound. With the means of bringing the parts into the wound described above and aided by Robson's [21] sand-bag under the lower dorsal spaces this objection is largely removed, and certainly does not apply to duodenocholedochotomy any more than to supra- or retroduodenocholedocotomy.

Postoperative dangers are said to be twofold: (1) duodenal fistula threatening starvation, and (2) infection leading to a fatal result. Of the 62 cases on whom the method has been used two have developed fistulæ. Of these, both Robson's [22] cases, one case, No. 288, died three weeks after operation from exhaustion due to difficulty in feeding on account of the duodenal fistula. The other case, No. 431,[23] developed some leakage from the duodenum which ceased after a time. In regard to infection much light has been thrown upon the subject by the vast amount of work done in the upper abdomen. In view of the freedom with which the duodenum, upper bowel, and stomach have been opened, it is clear this danger is not greatly to be apprehended, provided care is used in the work. In surgery of the bile tract, especially common duct stone and more particularly the late stage with stone impacted in the diverticulum of Vater, it is the effect of obstruction and infection on the liver rather than peritonitis that causes death, as brought out by W. J. Mayo.[24]

The mortality of the cases operated on by the method under discussion is briefly as follows: viz., 62 cases of all sorts with 8 deaths give a mortality of 12.6 per cent. Deducting from the number of cases the three pancreatic cases of Robson and the two neoplasm cases of Mayo and subtracting the 3

deaths in these five cases, we have respectively 57 cases and 5 deaths or 8.77 per cent. for the mortality of duodenocholedochotomy in the gall-stone cases. Until comparatively recently, Robson's [25] mortality for choledochotomy was 16.2 per cent., but more recently has been lowered to 5 per cent. Kehr [26] has a mortality of 6.5 per cent. and the Mayo's,[27] 11 plus per cent. It thus appears that the average of early and late duodenocholedochotomies gives a mortality per cent. comparable with the more recent statistics of supra-duodenal-choledochotomy.

In order to determine whether or not there were operative any factors peculiar to duodenocholedochotomy in the 5 deaths in the stone cases, it will be necessary to go behind the returns and ascertain briefly the causes of death. One of McBurney's cases died on the third day after operation, in spite of all efforts to check it, of persistent hæmorrhage from minute vessels associated with deep and long-continued jaundice. The second died of uncontrollable vomiting on the fourth day and at a secondary operation no abnormality or cause of death was demonstrable. These accidents are features of the conditions present at operation regardless of the special form of procedure and therefore are not rightly chargeable to duodenocholedochotomy. Besides the death mentioned above, in which a fistula was conspicuous, Robson [28] has had a death-case, No. 243, following the operation due to a subdiaphragmatic abscess overlooked at both operations. Nothing in connection with the operative field was found post-mortem to be abnormal. Another case died of heart failure from presence of acute dilatation of the stomach, nothing else being found to account for the death. It appears from the records, then, that one death with fistula and one case with temporary fistula may fairly be cited, to the discredit of the operation. In view of this it hardly can be said that duodenocholedochotomy is extra hazardous. It has participated *pari passu* in the benefits of accumulated experience and improved technique which have accrued to this field from the vast amount of work done in the last few years. A point worthy of consideration, too, in comparing supra- and

transduodenal mortality, is that other things being equal a stone impacted in the diverticulum or papilla of Vater represents on the average a later period in the disease process, and hence greater danger from local injuries to the parts and systemic effects of chronic jaundice and infection.

The other operations calculated to accomplish the purpose of duodenocholedochotomy are the usual supraduodenal operation and retroduodenal choledochotomy. The former fails to be effective in just the class of cases for which the transduodenal operation was primarily intended, and offers, besides, no real diminution of risk. It is advantageous in some cases to perform both where stones are distributed along the common duct and finish by drawing gauze strips from the upper opening through the duct to sweep it clean. As a substitute for the transduodenal route the operation of retroduodenal-choledochotomy has been proposed and performed. Berg,[29] basing his views on dissecting-room work, has found with Brewer [30] under like conditions difficulty in finding the papilla.

The fallacy of drawing conclusions from comparisons between anatomical and pathological conditions has already been mentioned. Berg also claims the initial though slight danger of immediate peritoneal infection and that of a subsequent duodenal fistula as objections to the transduodenal route. Quervain [31] gives a summary of the work done along this line and reports a case. The first step in this procedure was taken by Lane [32] when he freed the upper part of the duodenum behind for purposes of investigation, but removed the stone by supra-duodenal-choledochotomy. Later, Kocher [33] endeavored to displace the duodenum to one side to reach the posterior wall, but on account of hæmorrhage from the pancreas changed to the transduodenal route. Jeantry [34] reports three cases performed by Monprofit. Some few others have performed operations which seem to have been along this line. After describing his own case, he sums up the situation by saying that the retroduodenal route is indicated in cases in which the duodenum may be freed in a clear, trim (Sauber) way. Where the duodenum, common duct, and pancreas are

matted together by adhesions, and one runs the risk, in separating the same, of injuring the walls of the gut, or starting hæmorrhage, in spite of care, one would do better to proceed by the transduodenal route. From a study of the anatomy of the pancreas and its relations to the duodenum and common duct especially as brought out by Robson [35] it would seem clear that this route would frequently on anatomical grounds alone not be available. Furthermore, the difficulty and time involved at the start in freeing the duodenum behind while working, as one must, at the bottom of a deep cavity will hardly appeal to one as advantages compared to the freedom and speed of the transduodenal route with the parts elevated well into the field of operation. Furthermore, additional time will be consumed in any attempt to replace the duodenum in its original position after extraction of the stone. Finally, there is a condition, an instance of which has recently come under the notice of the author, in which neither of these procedures would have been adequate, while Kocher's trans-duodenal-choledochotomy would have answered very well. I refer to a case with a stone the size of an olive low down in the common duct, a gall-bladder the size of a hazel-nut, absolute stenosis of papillary orifice, and a history of jaundice of fifteen months' standing with numerous ague-like attacks of fever, etc. The patient died from capillary and venous hæmorrhage from broken up adhesions and in spite of calcium chloride, etc. Post-mortem, it was clear that (1) retro-duodenal-choledochotomy would have been impracticable from the comprehensive manner in which the head of the pancreas embraced the junction of the common duct with the duodenum; (2) supra-duodenal-choledocotomy would have been but a preliminary step to a secondary choledochoduodenostomy, and (3) Kocher's trans-duodenal-choledochotomy with subsequent anastomoses using the same incision in duct and gut would have accomplished the choledochoduodenostomy in the easiest and quickest way.

A brief account of the author's case is as follows:

E. M. B., female, forty-six years old, had a primary chole-

cystotomy at my hands, January 10, 1903, whereby seventy-odd stones were removed. The fistula closed in five (5) weeks with an uninterrupted recovery except for slight return of nausea and vomiting, and colicky pains on the eleventh (11) and twenty-third (23) days respectively after operation. April 3, 1903, I was called to see the patient again and found her suffering with a severe attack of biliary colic. This time there was a slight but distinct trace of jaundice. Patient was removed to the hospital and operated on the same day. On opening the abdomen, it was interesting to notice the absence of adhesions except for one small band connecting the fundus of the gall-bladder with the peritoneum of the abdominal wall where it had been sewed at the first operation. Examination showed one small stone in the gall-bladder and another stone in the common duct where the latter passes through the duodenal wall. Several endeavors to pass the stone into the duodenum or up into the free part of the common duct were unsuccessful, although the stone was susceptible of slight movement, ball-valve stone of Fenger. It became clear the simplest and quickest way for removal was by the duodenum. Securing the stone firmly in the fingers of the left hand, and thus establishing a fixed point, the wall of the duodenum was incised on its antero-external aspect. The papilla was easily dilated and the stone removed. I then sounded carefully from below and found no more stones in the common or hepatic ducts, and closed the duodenum after satisfying myself that there was a free flow of bile at the outlet of the common duct. I suspected the gall-bladder of having contributed the offending stone, and having more in the cystic duct besides the one readily felt at the fundus. I concluded, in view of its contracted and thickened walls and the stones to remove it. Tying the cystic duct where it joins the hepatic, I dissected the mass from the liver. The slight hæmorrhage was controlled by gauze packing, while gauze drains were placed to the wound in the duodenum and stump of the cystic duct. After four days of rectal feeding oral feeding was begun. The dressing was done the fourth day for the first time, and the wound healed kindly and closed the thirty-fourth (34) day. On the thirtieth (30) day after operation the patient menstruated, and during the menstrual period suffered with vertigo, headache, nausea, and vomiting. The vomitus contained bile, showing the

duct to be patent. Now, more than two (2) years later, patient reports herself as well and free from symptoms. On examination the bladder and cystic were found to contain many small stones, those in the duct being so distributed in folds and pockets as to obliterate the lumen of the duct.

Summing up the points for and against the transduodenal route it will be convenient to consider the question of neoplasm of the papilla and pancreatic calculi as well as gall-stone for the reason that a fine discrimination in diagnosis is often impossible in this class of cases.

(1) In favor of duodenocholedochotomy for gall-stones in the lower end of the common duct are (*a*) the avoidance of drainage in some cases where one would not otherwise wish to sew up the wound in the duct and close the abdomen; (*b*) the greater ease in sewing the duodenal than the duct incision by virtue of size and proximity of the former; (*c*) uniformly kindly healing of intestinal wounds; (*d*) easy and natural access to common duct; (*e*) ease and benefit of dilatation of papillary orifice in ensuring better drainage of bile and detritus; (*f*) duct may be safely incised for half an inch in extracting stone or in enlarging the orifice for drainage. Against the procedure has been raised the common prejudice against opening gut in general, the fear of fistula which occurred in but two out of sixty-two cases, and the dread of infection which, as indicated above, has been vastly overrated in regard to the upper half of the intestines.

(2) In neoplasm of the papilla this route is clearly indicated for diagnosis and treatment where the growth is amenable to local treatment and the gall-bladder cannot be used for anastomosis or drainage.

(3) In total stenosis of the papillary orifice, whether from neoplasm or trauma of stones, a choledochoduodenostomy could be done with the incision employed in duodenocholodochotomy, where the anastomosis could be made low down in the common duct.

(4) In pancreatic stone, duodeno-pancreo-lithotomy is an

established procedure and for good anatomical reason is the method of election.

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CONSTRICTION OF THE DUODENUM BELOW THE ENTRANCE OF THE COMMON DUCT AND ITS RELATION TO DISEASE.[1]

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SEVERAL years ago my attention was first directed to an interesting condition which is frequently present in patients which come under my observation during gall-bladder and stomach operations.

In many of these cases the duodenum is distended with gas to a point just below the entrance of the common duct,

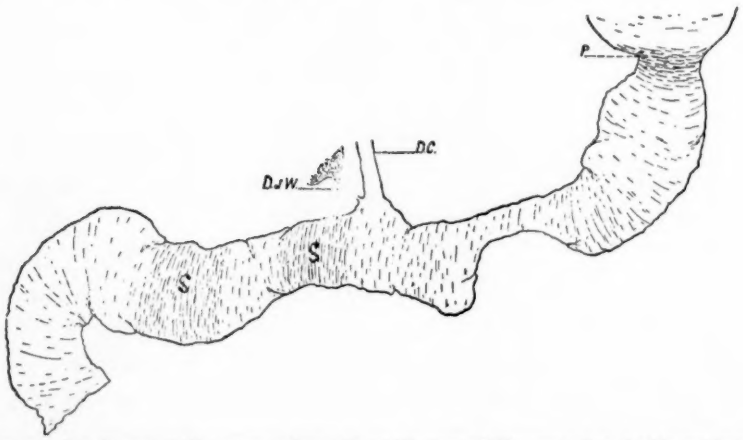

FIG. 1.—*P*, pylorus: *D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, a double sphincter.

while below this it is contracted, and upon raising the transverse colon and finding the origin of the jejunum, this portion of the intestine will also be found in a contracted condition.

In looking over authorities upon the subject of anatomy, I found that they all state that the third portion of the duodenum is the narrowest part of this intestine if they make any statement upon the subject. They also state that the first portion of the duodenum is usually found stained with bile after death.

[1] Read before the American Surgical Association, July, 1905.

Several further clinical observations pointed in the same direction.

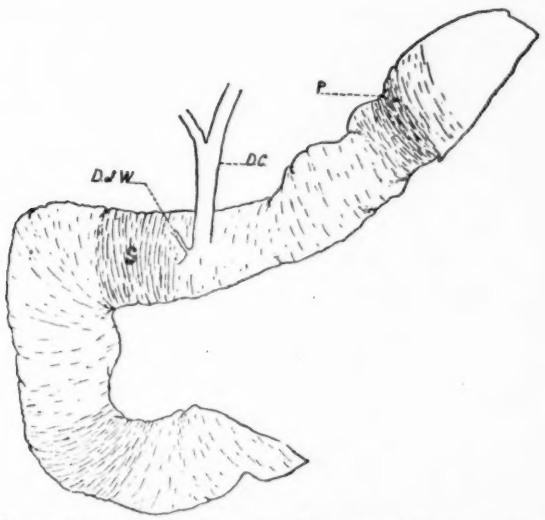

FIG. 2.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, sphincter below common duct.

It was found that the dilatation of the upper portion of the duodenum was most commonly present in patients suffering from chronic cholecystitis with sand or gall-stones in the

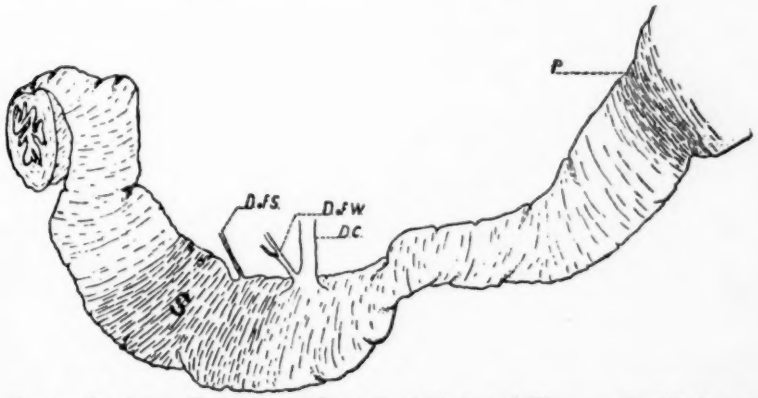

FIG. 3.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *D. of S.*, duct of Santorini; *S*, sphincter below entrance of common duct.

gall-bladder. In these cases there was frequently a more or less marked enlargement of the pancreas.

In having the vomitus examined systematically for a con-

siderable period of time in patients who had been subjected to general anæsthesia for operation, it was found that the vomitus invariably contained bile, showing that there must be some reason why this fluid should be forced upward past the pyloric sphincter rather than downward through the small intestine.

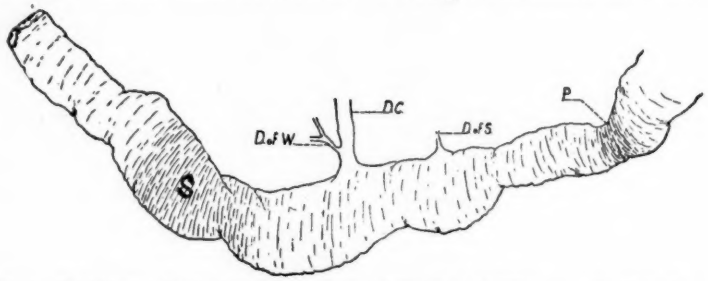

FIG. 4.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *D. of S.*, duct of Santorini; *S*, sphincter below entrance of common duct.

Again, it was found that in patients suffering from acute gall-stone colic, the spasmodic pain would subside invariably within a few hours upon making careful gastric lavage and prohibiting the introduction of any kind of food into the stom-

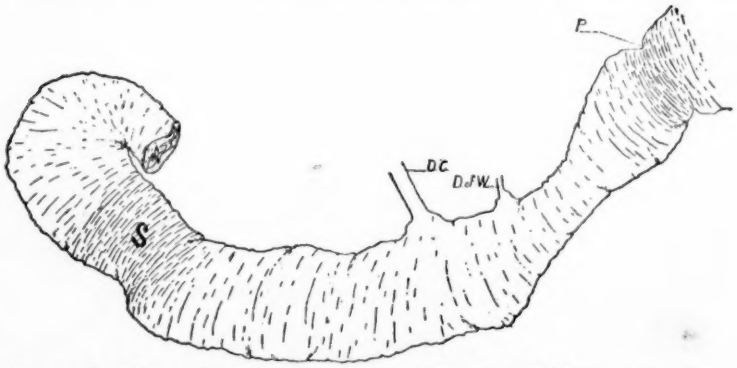

FIG. 5.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung, 2½ centimetres from *C.D.* towards *P.*; *S*, point of greatest development of circular muscle fibres 10 centimetres below the entrance of the common duct.

ach, although without this aid large doses of morphine, given hypodermically, had given at best only temporary relief in these cases.

This seemed to indicate that there must be some point near the entrance of the common duct into the duodenum which regulates the passage of food through this intestine.

Since making these observations, the beautiful experiments of Dr. Cannon, and more recently those of Cannon and Blake (ANNALS OF SURGERY, May, 1905) have added another

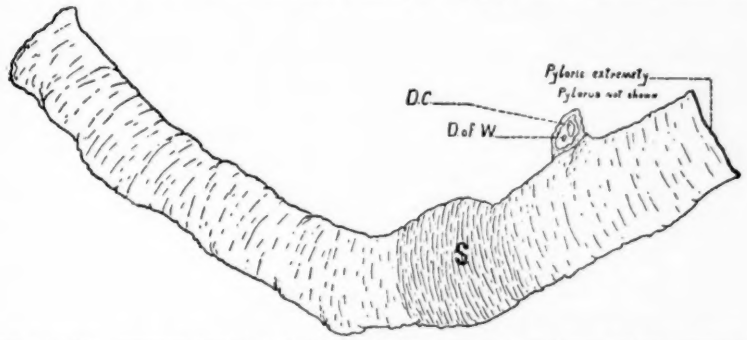

FIG. 6.—*D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, sphincter below entrance of common duct.

fact in the same direction by demonstrating that there is a distinct mixing process which takes place in the upper portion of the duodenum.

These clinical observations have induced me to make a

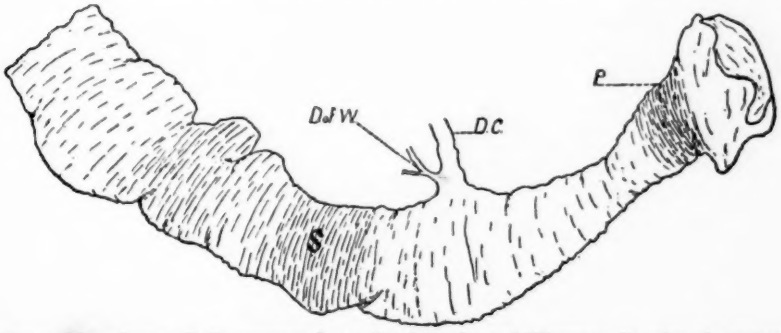

FIG. 7.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, point of greatest development of circular muscle fibres.

careful anatomical study of this portion of the small intestine, both in the living patient and in the cadaver.

My assistant, Mr. E. W. Thuerer, has dissected ten specimens, and has made accurate full-size tracings of the duodenum in each of these cases. He has further confirmed our observation by inspecting the duodenum in all cadavers dissected in the Medical Department of the University of Illinois during the past winter.

These specimens show a marked uniformity in several directions, as will be seen at once from the drawings.

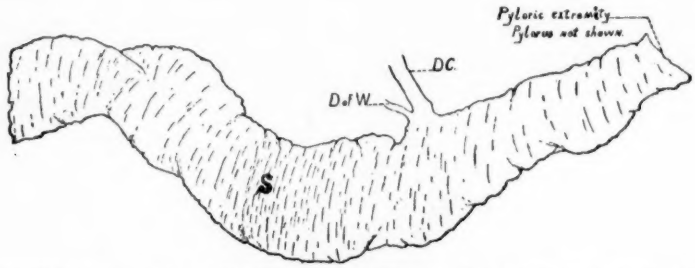

FIG. 8.—*D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, point of greatest development of circular muscle fibres.

In all of these specimens there is a greater or less degree of narrowing between the pylorus and the entrance of the common duct; this can also be seen perfectly in the speci-

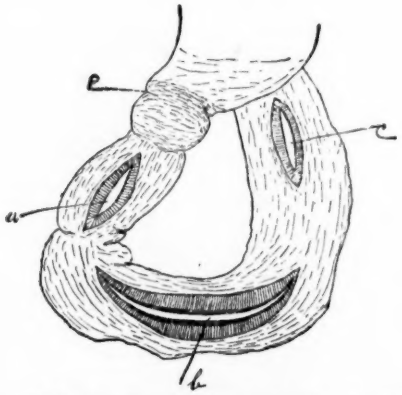

FIG. 9.—*P*, pylorus. The longitudinal incisions *a*, *b*, and *c* show the relative thickness of the circular muscle fibres, (*a*) between the pylorus and the point of entrance of the common duct, (*b*) at the point of greatest thickness 4 centimetres below the common duct, and (*c*) at the point of the duodenum 15 centimetres below this point.

mens at the present time, although their immersion in preserving fluid has, of course, brought about some changes.

In all of these specimens there is also a more or less marked thickening of the intestinal wall at a point 2 to 4 centimetres below the entrance of the common duct, and a careful study of this thickening demonstrates the presence of a marked increase in the circular muscle fibres, as is shown by

the accompanying microscopic sections taken from various portions of the intestinal wall as compared with this portion of the wall.

The arrangement of these circular muscle fibres would remind one very forcibly of the arrangement in the pylorus, although the fibres are much more diffuse, making a broad sphincter.

It seems as though all of these facts pointed towards the presence of a sphincter at this point whose physiological function would consist in providing for a means of retaining the

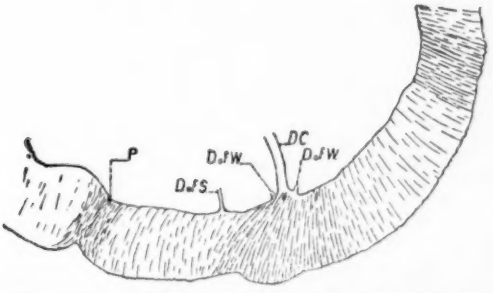

FIG. 10.—*P*, pylorus; *D. of S.*, duct of Santorini; *D. of W.*, duct of Wirsung, double in this case. The circular muscle fibres arranged obliquely, there being a sphincter-like arrangement directly opposite the entrance of the common duct.

chyme in the upper portion of the duodenum sufficiently long to provide for a thorough mixing with bile and pancreatic fluid, just as the pylorus serves the purpose of retaining the stomach contents, and the ileocæcal valve of retaining the contents of the small intestines.

We have long known that under certain pathological conditions the obstruction offered by the pylorus is increased far beyond the normal.

We also know that the passage of intestinal contents and gas is obstructed to a marked extent as the ileocæcal valve in case of inflammation in this vicinity, which is, of course, usually due to appendicitis; and it has seemed to me as though the above facts would indicate that under certain forms of irritation or inflammation of the gall-bladder or ducts, this duodenal sphincter had taken up a similar action, which would have to be considered physiological in character.

No.	Hosp. No.	Sex and Age.	Occupation and Nativity.	Past History and Family.	Condition.	Character.	Complications.	Examination.	Condition at Operation.
1	15342	F. 39	Housekeeping, U. S.	Unimportant. ?	Gastro-enterostomy, cholecystostomy, gastric ulcer, cholecystitis.	Epigastric pain, vomiting; hæmatemesis six years.	Appendicitis 2 years ago, appendectomy 2 years ago; relief for 1 year and then recurrence of symptoms.	Epigastric tenderness; gastric ulcer, stomach not dilated.	Posterior surface near pylorus, gaping pylorus, duodenum distended; gall-bladder enlarged, sacculated, and contained dark, sandy bile; no stones.
2	15346	F. 40	Housewife, U. S.	Unimportant. ?	Gastric ulcer, chronic appendicitis, gastro-enterostomy, appendectomy.	Epigastric pain and gastric distress; seldom vomiting blood.	None.	Epigastric tenderness; stomach dilated; emaciated and anæmic.	Scar of old ulcer on anterior surface of pylorus; lymph glands enlarged, pylorus open 6½ centimetres; appendix walls thickened; gall-bladder and pancreas normal.
3	15598	M. 49	Farmer, Sweden.	Liver trouble, cholecystitis. ?	Gastric ulcer, cholecystitis, gastro-enterostomy, cholecystostomy.	Right hypochondriac pain and constipation ten years; vomiting first three months; no blood; colicky pain in inguinal region.	Neurosis.	Tenderness beneath right costal margin and in right inguinal region.	Scar on posterior surface of pylorus, which is contracted and on jejunum; gall-bladder sacculated, distended with dark, sandy bile: appendix normal.
4	15635	F. 34	Housewife, Sweden.	Neurotic. ?	Ulcer duodenum, gastrectasis, lacerated perineum, gastro-enterostomy.	Vomiting and headaches.	Neurosis with enteroptosis.	Thin, anæmic; no marked abdominal tenderness.	Stomach and duodenum dilated; lymphatics enlarged; appendix and gall-bladder normal.
5	14254	F. 29	..... U. S.	Unimportant. ?	Cholecystitis, pancreatitis, gastrectasia, appendicitis, cholecystostomy, appendectomy.	Gastric distress after eating; intermittent attacks of vomiting; no hæmatemesis.	None.	Epigastric tenderness; emaciation and anæmic; anorexia.	Duodenum as large as stomach as far as common duct, where it is adherent to enlarged pancreas and constricted; appendix cicatricial; duodenum adherent to liver.
6	14427	F. 24	..... Denmark.	Unimportant. ?	Gall-stones, chronic appendicitis, cholecystostomy, appendectomy.	Epigastric, right hypochondriac and right inguinal pains; nausea, vomiting, jaundice; no hæmatemesis.	None.	Tenderness beneath right costal arch; poorly nourished and anæmic.	Duodenum enlarged, ducts free; cystic duct dilated; gall-bladder contains stone, black, sandy bile, numerous stones, and shreds of tissues.

7	14580	F. 48	Housewife, Sweden.	Typhoid at 21 years. ?	Cholecystitis, gastrectasia, appendicitis, cholecystostomy, appendectomy.	Appendicitis attack 6 years; for 2 years epigastric pains, radiating to right side and back; vomiting.	None.	Tenderness over McBurney's point beneath the right costal margin and over the middle epigastrium; fairly well nourished, but anæmic.	Stomach and duodenum down to point opposite papilla dilated; omentum adherent to thickened gall-bladder, which contained dark bile.
8	14603	F. 53	Housewife, U. S.	Recurrent attack of gastritis. One sister died, ulcerated stomach.	Gall-stones, gastrectasis, pancreatitis, appendectomy. cholecystostomy.	Epigastric pain after eating lasts an hour; never vomits.	None.	Tenderness marked over Robson point; poorly nourished and anæmic.	Stomach and duodenum down to point opposite papilla dilated; pancreas enlarged; common and cystic ducts contain stones; chronic appendicitis.
9	14638	F. 51	Housewife, Sweden.	Typhoid at 18 years. 2 brothers died of gastric trouble; cancer.	Cholecystitis, pancreatitis, cholecystostomy.	Hypochondriac pain; seldom vomiting; tenderness.	Epilepsy.	Tenderness in both upper abdominal quadrants.	Duodenum dilated down to papilla; pancreas enlarged and hard; gall-bladder enlarged, walls thickened, contains tarry bile.
10	14666	F. 31	Housewife, U. S.	Recurrent attack of stomach trouble. Unimportant.	Cholecystitis, appendicitis, cholecystostomy.	Recurring attacks of epigastric pain, gastric distress, vomiting and jaundice.	None.	Well nourished; tenderness beneath the right costal margin.	Duodenum dilated; gall-bladder contained tarry bile; appendix distended.
11	14728	F. 68	Housewife, German.	?	Cholecystitis, pancreatitis, appendicitis, cholecystostomy.	Hypochondriac pain; vomiting.	None.	Emaciated, anæmic; epigastric tenderness.	Duodenum greatly distended: gall-bladder contained black sandy bile.
12	14787	F. 58	Housewife, Sweden.	Chlorosis at 16 years. ?	Cholecystitis, pancreatitis, cholecystostomy.	Constipation about 2 years.	None.	Emaciated; anæmic.	Duodenum dilated, pancreas enlarged; gall-bladder contained tarry bile.
13	15443	M. 39	Machinist, German.	Typhoid in boyhood. ?	Gall-stones, cholecystostomy, pancreatitis, appendectomy.	Recurrent attacks of epigastric pain with vomiting; jaundice at times.	None.	Tenderness above McBurney's point and just above the umbilicus.	Duodenum dilated, pancreas enlarged; cholelithiasis, cholecystitis, chronic appendicitis.
14	15689	F. 48	Housewife, Sweden.	Unimportant. Unimportant.	Gall-stones, pancreatitis, cholecystostomy.	Recurrent attacks of epigastric pain and vomiting; no jaundice.	None.	Epigastric and hypochondriac tenderness; well nourished.	Stomach and duodonum dilated; pylorus normal; gallstones, cholecystitis, pancreatitis, dark, sandy bile.

AN ANOMALY OF THE DUODENUM RESULTING IN DEATH AFTER GASTRO-ENTEROSTOMY.

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SURGEONS have come to think that the causes of death following gastro-enterostomy are (1) a failure of union at the site of anastomosis, with consequent peritonitis; (2) vicious circle vomiting; (3) shock, and (4) pneumonia. I am recording this case because it presents a fifth cause, a preventable cause; an abnormally short duodenum rendering inadequate and dangerous the operation of posterior gastro-enterostomy with the short loop in those cases associated with an immobilized but greatly distended stomach. So far as I know, no similar case has been reported, and the condition is somewhat rare; but it is important and interesting.

The patient's history is commonplace enough. He was a young man of twenty-nine, a motorman, who had suffered severely with gastric symptoms for five years. It was obvious that he had a greatly dilated stomach, the lower border being two inches below the umbilicus, while there was no apparent ptosis, the upper border not being visibly out of the normal position. An immovable mass, about the size of a pigeon's egg, could be felt in what was thought to be the pyloric region. It was assumed that this mass was inflammatory, and a drainage operation was advised.

Accordingly, on July 8, I opened the abdomen, and found the anticipated conditions. Fig. 1 shows them fairly well. A large part of the pyloric portion was greatly thickened, and was held up to the liver by strong and dense adhesions. No enlarged mesenteric glands were found. So the pyloric portion, owing to its great and extensive thickening, entered but little into the dilatation, which was composed of the thinned and ballooned fundus.

On turning up the omentum, colon, and stomach, and search-

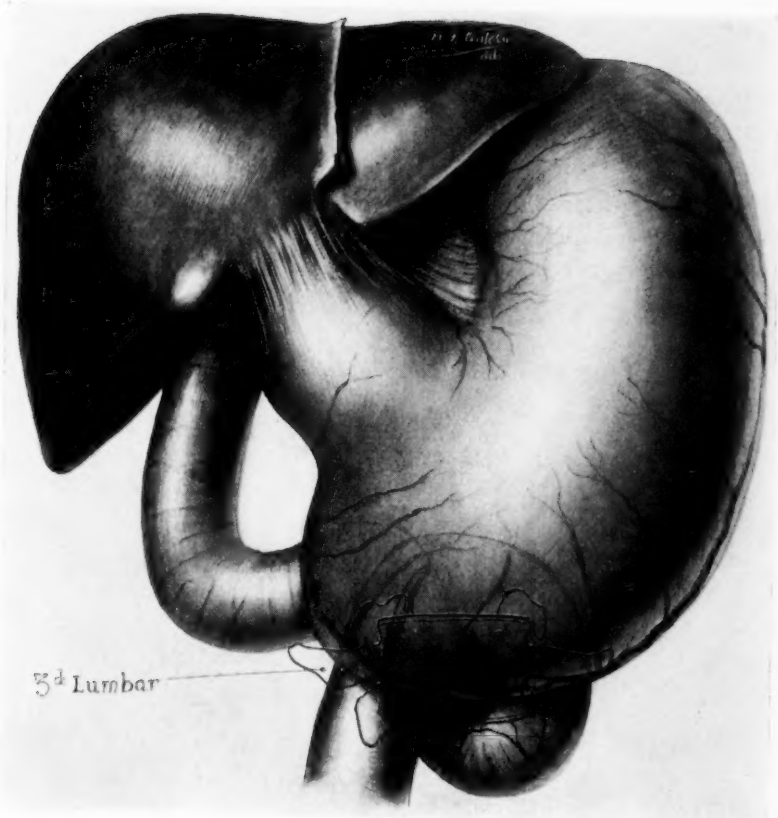

FIG. 1.

FIG. 2.

ing for the jejunum, I found that that portion of the gut did not spring from a ligament of Treitz upon the left crus of the diaphragm, but from the right crus. In other words, the fixed duodenum ended upon the right of the spinal column. I thought little of this at the time, and merely mentioned it as an interesting anomaly to my little audience. I had intended to do Finney's pyloroplasty, but, as the conditions were unsuitable, I proceeded with the familiar short-loop posterior gastro-enterostomy. The opening in the stomach was made as near the pylorus as I dared to place it, in view of the thickened and friable condition of the gastric wall at that portion. The opening in the jejunum was made about three inches from the ligament of Treitz, the fixed portion of the intestine. In other words, the play allowed to the movable stomach and jejunum was to be limited by the short radius—ligament of Treitz to anastomotic opening—afforded by the three-inch limb of jejunum; and in this patient's case the centre from which the radius sprung was upon the right of the spinal column. The anastomosis was made by stitching, without other mechanical device, and, at the end, the technique seemed to be satisfactory.

The patient bore the operation extremely well, and assured me, the next morning, that he had not felt so comfortable for years. Promptly his appetite returned, his bowels acted well, and the quality of his diet was changed from day to day as his keenness for food increased. All went satisfactorily until the fifth day. That morning he complained of some slight epigastric uneasiness, and was immediately put upon a liquid diet with bicarbonate of soda. Nothing more was heard from him until midnight, when he underwent a sudden and violent paroxysm of severe abdominal pain, associated with profound and alarming collapse. Morphia did not quiet him, and the house-surgeon was obliged to use ether. Thus the patient continued until ten o'clock the next morning (ten hours), when he died.

This catastrophe was not clearly explicable until the autopsy, when an interesting and significant situation was revealed. The abdominal cavity was found flooded with gastric contents. On exploring carefully the stomach, which appeared contracted nearly to the normal size, a large rent was found far to the left, in the fundus of the stomach. At first it was thought that this must be

the perforation of an ulcer, undetected at the operation. It did not seem probable that the anastomotic stoma could be so far from the pylorus; but on farther investigation this rent was found to be the stoma with a portion of the torn-off jejunum attached to its right-hand border. The short arm of this portion of jejunum ran to the ligament of Treitz. It was on the stretch and measured four inches from the stoma to the ligament. Fig. 2 illustrates this appearance.

A little reflection served to explain the rather surprising new arrangement of the parts, and to show what had been going on inside the unfortunate man's abdomen. So long as the stomach remained dilated, the new stoma and the efferent and afferent loops lay in easy relation, and performed their functions. With drainage and rest, however, the overdistended stomach fundus retracted towards a normal position and size. As it retracted it stretched and gradually dragged the afferent loop towards the left, until that portion of the bowel found itself drawn tightly between its fixed point, the ligament of Treitz, and its retracting point, the gastro-intestinal stoma. It gave way accordingly at its new attachment, with a result fatal to the patient. In such a case as this, it is a lamentable reflection that the more perfect the artificial stomach drainage so much the more rapid is the stomach retraction, and so much the earlier is the fatal result. In another similar case I should perform posterior gastro-enterostomy and entero-enterostomy with section of the afferent loop between the two anastomotic openings.

Unfortunately for surgeons, anomalies of the third and fourth portions of the duodenum are not so rare as many standard text-books state. Quain and Gray hold that the fourth portion ends on the left of the aorta, but recent studies show that statement to be incorrect frequently.

Several years ago, Professor Thomas Dwight tabulated the results of his observations on the duodena of *fifty-four* adults (*Journal of Anatomy and Physiology*, vol. xxxi, page 516). His findings are so strikingly at variance with the common teaching, and are so important withal, that I quote the following paragraph:

"The usual statement that the third part (of the duode-

num) crosses the aorta, presumably with no peritoneum intervening, and that the fourth ascends on its left, is incorrect. Jonnesco admits that this last part is much less firmly attached than the second and third, so that it slides easily. He states that when the fourth part ascends vertically it lies on the lower third or quarter of the left kidney. . . . In point of fact, it is only exceptionally that the fourth part is prærenal at all. In the fifty-four cases already mentioned, the duodenum was on the right of the aorta, till just before the terminal flexure, twenty-six times. It was wholly on the right six times. The fourth part lay in front of the aorta eleven times, and the third part actually crossed the aorta eleven times."

In other words, from a study of Professor Dwight's paper, it appears that that rather indefinite structure, the ligament of Treitz, may lie in front of the spinal column or even slightly to its right in from 10 to 12 per cent. of adult cases, a fact noteworthy to surgeons, especially in view of the case I have reported here.

RESECTION OF INTESTINE, FOLLOWED BY END-TO-END ANASTOMOSIS.[1]

REPORT OF CASES WITH REMARKS.

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THE indications for resection of some part of the small or large intestine are well defined. Of the more frequent acute conditions may be mentioned the different varieties of gangrene, extensive damage to a loop of intestine through penetrating wounds, especially gun-shot wounds, and the destruction of its blood-supply through traumatic separation of its mesenteric attachment, or through the division of one of the terminal branches of a mesenteric artery.

Of the sub-acute or chronic conditions may be mentioned intestinal fistulæ that do not yield to less stringent measures, chronic obstruction in which coils of intestine are so firmly bound together that their successful separation is impossible and chronic benign strictures, including the tubercular and the rarer syphilitic varieties, especially if associated with intractable ulceration and cancer above the level of the sigmoido-rectal junction.

The clinical features of the acute conditions are so well understood that no special description of them is necessary. On the other hand, the clinical development of those chronic conditions not associated with external or visible change in the abdominal wall, especially of those causing stricture, is so varied and frequently so insidious that early diagnosis is impossible.

In benign stricture a tardy diagnosis does not necessarily affect adversely the chances of permanent relief through some surgical operation; on the other hand, inability to make an early diagnosis in malignant stricture diminishes greatly the chance of successful removal, and even in those occasional cases

[1] Read at the meeting of the New York Surgical Society, October 25, 1905.

in which resection is possible subsequent recurrence is greatly to be feared.

One of the greatest needs in surgery to-day is the discovery of some method by which malignant disease of internal organs can be detected in its incipient stages; and especially is this true of the organs of the abdominal cavity, for, not only in the intestine, but in the stomach and uterus as well, malignant disease, when its initial symptoms appear, is frequently beyond the possibility of successful cure. For this reason the early manifestations of malignant stricture of the colon should receive most careful consideration and analysis, although any considerable progress in facility of diagnosis can scarcely be achieved; for, in the first place, accurate diagnosis is frequently impossible because of the paucity of the symptoms. Thus, in some cases after a long period of uninterrupted health, the patient suddenly develops the symptoms of acute or subacute obstruction, and subsequent operation discovers a growth that must have existed for years. In the second place, even when early symptoms develop, a wide variation is seen to exist. Thus, in many, disturbances of digestion and increasing difficulty in the passage of the intestinal contents may attract attention. Under this general head, may be mentioned nausea and loss of appetite; the persistent fermentation and gas-production leading to a sense of fulness referred to some particular region in the abdomen—a feeling usually most marked from four or five hours after eating, according to the distance from the stomach to the stricture; the discomfort and occasionally, later, the actual pain, as the intestine above the point of stricture becomes more distended; the subjective sensation of relief due to the passage of the accumulated gas through the narrowed lumen below often accompanied by a marked gurgle. Such a train of symptoms should lead in every instance to repeated careful palpation of the abdomen and in doubtful cases to early exploration particularly where unusual thickness of the abdominal wall might conceal a growth of small size or where the growth lies in some deeper inaccessible part of the abdomen or pelvis.

In other cases, constipation may be the first symptom. Regularly, it should follow the group of symptoms just enumerated. After it has once appeared, it is more marked at those

times when, through the swelling of temporary congestion, the orifice of the stricture is suddenly greatly diminished. With the subsidence of congestion, constipation disappears; it is therefore an intermittent symptom. Occasionally, after ulceration has occurred, the foul discharge induces cartarrhal inflammation of the contiguous intestine and diarrhœa, sometimes with stools containing traces of pus and blood. Hence the "alternating diarrhœa and constipation" of which some authors write and which is actually an exceptional and sometimes misleading symptom, for the growth is almost always scirrhous and the resulting ulceration occurs not only at a later period but also with a discharge that is much less irritating than in the other varieties of carcinoma.

The initial appearance of constipation depends not only upon the degree of stricture but also upon its proximity to the rectum, due to the solidification of the fecal current in the lower part of the large intestine. In the sigmoid flexure, therefore, constipation is more likely to develop at an earlier period than in the upper part of the large intestine. But irrespective of the situation of the growth, constipation with subsequent obstruction develops only when the growth encroaches upon the lumen of the gut. Frequently the colon is involved with little or no diminution of its calibre and constipation is absent throughout.

Finally, in the absence of all previous symptoms, as has already been mentioned, the symptoms of sub-acute or acute obstruction may be the first indication of the presence of the growth.

The objective symptoms which need no special description are those of a tumor with or without an associated ascites and with, later on, the appearance of metastases in the liver and other parts of the body. Ordinarily this tumor cannot be felt for some time after the development of the initial subjective symptoms and even in the later stages it may, as has been stated, be concealed by a thick abdominal wall, the presence of moderate distension, or by the fact that it occupies a position inaccessible to palpation behind some viscus or below the brim of the pelvis. In the latter situation, as in Case IV, it may be felt by rectal examination.

It is also important to note that even under favorable

conditions, a most careful examination may fail to detect the growth a day or two after its successful palpation near the anterior abdominal wall (as in Case III, prior to operation) and also the fact that it may be felt in different parts of the abdomen in successive examinations. Both of these last mentioned variations are most likely to occur in growths that involve any portion of the alimentary canal that is provided with a mesentery and that have not as yet become adherent to immovable parts (in Case III, the ileum, in Case IV, the sigmoid). In the transverse colon a similar degree of mobility might be enjoyed, but in the four ascending or descending colons growths could possess at the very best only a slight range of movement.

The indications for resection in the treatment of stricture admit of little if any discussion. On the other hand, the means by which the patency of the canal shall be re-established vary greatly. Each particular method and each almost unending modification of that method have their adherents, and the investigator who endeavors to unravel the much-vaunted advantages of this or that proceeding encounters a confusing mass of incompatibilities and contradictions.

It is not the intention of the writer to discuss the comparative value of end-to-end, end-to-side, and side-to-side, methods of anastomosis, nor whether anastomosis is preferably accomplished by suture alone or with the aid of some artificial appliance. Much depends upon the condition of the resected ends as well as upon the general condition of the patient, which may be such as to demand the greatest speed. If no special hurry is necessary and if the resected extremities are of equal calibre and of normal appearance and consistency, it is the writer's opinion that any one of several methods will yield satisfactory results, preference being naturally given to that one to which the operator is accustomed. The method of end-to-end anastomosis, of which a brief description follows, is therefore not introduced by the writer as one necessarily superior to those in general use, but merely as one that has given satisfactory results, and seems, in the few cases reported, to have protected the patient from the dangers of a perforative peritonitis.

After the removal of the damaged or diseased intestine

and after the exposed ends have been prepared for suture in the usual way, those portions of the circumference included between the layers of the mesentery are carefully united with two or three interrupted sutures of chromic gut. In the small intestine, where this interval is narrow, one or two are sufficient; in the large intestine, where this interval is much wider, three or even four may be used.

Advancing then to either side alternately of the mesenteric attachment, similar sutures are passed between all the layers of the wall of the intestine except the serous coat and tied (with the exception of the last two or three) from within. In the process of repair, therefore, this first row of sutures should be discharged into the lumen of the gut. A second row of interrupted Lembert silk sutures is now passed around from one side of the mesenteric attachment to the other, the first and last sutures being inserted respectively on either side close to the junction of the mesentery and intestine.

If the sutured ends of the intestine are of normal appearance and free from congestion, the abdominal wound is then closed without further precaution or drainage, except in the sigmoid flexure, where a small cigarette drain may be passed down to the sutured gut. If, on the other hand, either of the resected ends is unduly congested, or friable, or of unequal size, even although the viability is unquestioned, the sutured loop may be fastened to the anterior parietal peritoneum by one or two plain cat-gut sutures and a small drain of gauze inserted on either side. In this way, subsequent leakage which under these circumstances is extremely likely to take place, may be conducted into the dressing, thus obviating the danger of a peritonitis.

In the sigmoid the integrity of the suture line from the distension of the upper segment with either gas or feces may be protected by insertion though the rectum to a point beyond the line of suture, of a rubber tube. This should be introduced by an assistant and guided by the surgeon's finger in the abdominal cavity to the desired point. The wound is then closed in the usual way, after the insertion of a small cigarette drain.

CASE I.—*Strangulated Inguinal Hernia; Necrosis of small Intestines: Resection; Recovery.*—T. M., male, aged thirty-five years; admitted to the Gouverneur Hospital, June 21, 1903.

Patient had had a reducible oblique inguinal hernia for the past ten years. During the latter part of that time he has had several attacks of acute irreducibility, all of which yielded to taxis and palliative treatment. Yesterday, while engaged in lifting, the hernia again became irreducible, and patient was seized with great pain and vomiting. All attempts at reduction failed.

On examination, there is an irreducible swelling in and occupying the region of the left inguinal canal, which presents all the usual symptoms of a strangulated hernia. The swelling extends a short distance below the external ring into the scrotum.

Operation.—Under ether anæsthesia, the hernial sac was exposed by the usual Bassini method. It contained considerable bloody serum, free from odor and a loop of small intestine of dark color and which, although without perforation at the point of constriction, yet was suspiciously flaccid over an area of about two inches in width. It had not yet lost its glistening appearance.

Owing to the doubtful viability of the exposed gut, which after the relief of the constriction (at the internal ring) still retained its dark color and flaccid consistency, its wall was sutured to the margin of the internal ring and a temporary warm dressing was applied. At the end of twenty-four hours, gangrene was established beyond a doubt and resection with end-to-end anastomosis was immediately done. With the completion of the anastomosis, a small wick of gauze was passed down into the abdominal cavity along with the sutured intestine and the remaining part of the wound was closed as far as possible according to the Bassini principle.

At no time during either operation or during the twenty-four hours intervening was the patient's pulse over 100.

Post-operative.—There was little if any reaction, the temperature and pulse both remaining below 100. There was instant cessation of vomiting, and in the course of twenty-four hours passage of flatus from the rectum. There was no distention. During the third day discharge of fecal matter appeared in the wound. This became very abundant but did not represent the entire intestinal contents, as the bowels moved regularly after the second day. The color and consistency of the fecal discharge

corresponded to that ordinarily found in the upper part of the small intestine. At the expiration of a week, it had greatly diminished in amount and before the end of the third week had entirely disappeared. At no time was the general condition of the patient materially weakened.

The wound closed rapidly and at the end of the fifth week, the patient left the hospital.

The patient was examined occasionally during the next twelve months; at the end of which time no recurrence had taken place. Owing to the fact that the wound was left open at its inner angle a late recurrence may be expected.

CASE 2.—T. I., aged forty-seven years; admitted to the Presbyterian Hospital, February 21, 1903. For the past fifteen years, patient has had a reducible right inguinal hernia. During the past five years, the hernia has been satisfactorily held back by a truss. This morning, however, while straining at stool, the hernia became irreducible and painful, slipping down behind the truss. There was some nausea but no vomiting, and the bowels moved to enema freely on both the 21st and 22d.

On examination, there is a right irreducible oblique inguinal hernia, extending down to the testis. There is a distinct expansile impulse on coughing. The swelling, though not painful, is moderately tender. There is slight indefinite pain referred to the lower part of the epigastrium in the middle line. The temperature ranges between 99 and 100, the pulse about 90 to 100.

The foot of the patient's bed was raised by shock blocks and an ice cap applied to the swelling.

February 22. Vomited some broth to-day at noon. No vomiting had occurred at any previous time. Discharge of flatus and a small amount of fecal matter from the bowel. There is more pain and some fulness in the lower part of the epigastrium. On palpation in this region, there is slight tenderness and rigidity.

February 23. Bowels moved to-day with enema. There was one attack of vomiting after taking broth in the morning. There is some restlessness. The hernia is gradually decreasing in size.

February 25. During the night, there was intense abdominal pain with considerable hiccough, interfering with sleep. There was one attack of vomiting during the afternoon and again in the evening. Two movements of the bowels, secured by enema, gave relief. Patient does not look seriously ill.

February 26. A repetition of yesterday. Pulse has not been over 88 at any time since admission and the temperature is normal.

February 27. Another good result from enema. There is still occasional vomiting after taking food.

February 28. To-day, for the first time, visible peristalsis appeared in the right iliac fossa with slight distention of the lower part of the abdomen. Patient feels cramp-like pains which disappear with inward rumblings of gas. There is some rigidity in the lower right quadrant above the situation of the internal ring. General condition unchanged.

During the next forty-eight hours, the hiccoughing and vomiting became less, but the rigidity and distention continued unabated and the bowels moved with increasing difficulty.

Operation.—Ether. A median incision below the umbilicus was made, and the peritoneal cavity opened. There was a small amount of free serous odorless fluid. Over toward the right side, in the lower quadrant, the small intestine was congested and swollen and the loops were smeared with fibrine. Almost immediately, on the separation of these soft adhesions an abscess cavity was opened, and at the wall of internal ring at a point where it had been constricted by the margin of the interna (an adjacent loop of small intestine) an orifice was seen, through which intestinal contents escaped. Another constriction was seen in the loop at a distance of six inches, but this had not given way. The damaged loop which was very friable was resected, followed by end-to-end anastomosis, and after the insertion of several small wicks of gauze, the closure of the remaining part of the wound.

Post-operative course.—Owing to an associated endarteritis, the patient's general condition remained poor for several days, the pulse ranging from 120 to 140, although the temperature was below 100. There was, however, no sign of peritonitis and on the day following operation considerable flatus was expelled through the rectum. On the fourth day, after repeated small doses of phosphate of soda, the bowels moved several times. On the fifth day after operation, at the time of the second dressing, a slight fecal discharge was noticed. On the tenth day, the fecal discharge was quite abundant, but from that time on, rapidly decreased and had entirely disappeared by the 24th day, leaving a healthy granulating surface which slowly cicatrized.

On May 8, patient left the hospital, completely healed, having gained between 20 and 30 pounds in weight.

On examination one year afterward, the patient's general condition was excellent and there was no recurrence of the hernia.

Bacteriological examination of the pus showed the presence of the bacillus coli communis, while that of the excised intestine showed "beginning necrosis."

CASE 3.—H. K., male, aged sixty years; admitted to the Presbyterian Hospital, May 1, 1903. Patient was always well until seven months ago. At that time, without known cause an attack of abdominal pain and vomiting occurred, lasting but a few hours. These attacks have recurred every three or four weeks and recently have lasted for a week or ten days with a sense of obstruction to the passage of the intestinal contents. Vomiting has always occurred shortly after the taking of food, the vomitus consisting of the contents of the stomach and never containing blood in any form. There has been constipation for the past three months, the bowels moving every three days to catharsis.

On examination, there is intermittent moderate distention of the central part of the abdomen. This usually disappears after a movement of the bowels, and at that time, a small ovoid hard tumor can generally be felt in the right iliac fossa. Occasionally no mass can be felt in this situation. Examinations of the stomach and rectum negative.

Operation.—Gas and ether. Under ether no tumor could be felt. An incision below the level of the umbilicus along the outer margin of the right rectus muscle was made and the peritoneal cavity opened. The affected loop of small intestine was easily found directly in front of the promontory of the sacrum within the cavity of the true pelvis and presented a hard nodular tumor, involving its entire circumference, situated about ten inches from the ileo-cæcal junction. The lymphatic glands in the adjacent portion of the mesentery were hard and nodular even as far as its vertebral attachment. This extensive lymphatic involvement necessitated the removal of about eighteen inches of small intestine. An end-to-end anastomosis was then done, and the abdomen closed without drainage.

Post-operative.—Primary union was secured. Flatus was expelled by the rectum and a movement occurred on the first

day after operation. Rectal alimentation was carried out for forty-eight hours and then small quantities of peptonized milk were given. There was no vomiting or distention at any time after the operation.

On gross examination, the tumor appeared to be a scirrhus carcinoma involving the entire circumference of the intestine and diminishing by at least one-half the patency of its lumen. On microscopic examination, the tumor proved to be an adeno-carcinoma.

Six months after the operation, the patient had gained sixty pounds and worked without interruption. The bowels were regular and he was free from pain. About ten months after operation evidences of recurrence appeared in the liver from which the patient died one year after his discharge from the hospital.

CASE 4.—J. E. R., male, aged forty-nine years; referred by Dr. Conkey. Admitted October 22, 1903. Father died of cancer of intestine. With the exception of scarlet fever when a child, an attack of acute articular rheumatism when twenty, and an occasional attack of bronchitis during the winter, patient was always in excellent health until August, 1902, when he first noticed pain in the left side. The pain was usually in the vicinity of the anterior superior spine and was of a burning character. Occasionally it was so severe as to be scarcely endured. The stools were loose and blood-stained and contained shiny matter. The patient was treated for hemorrhoids without any local examination being made. Since that time, there has been gradual loss of flesh and strength. At present, the chief complaints are pain in the left flank, anorexia, general weakness and attacks of diarrhœa with bloody stools.

By rectal examination, a mass can be made out high up through the posterior rectal wall, freely movable from side to side. On bi-manual examination the same mass can be distinctly outlined in the median line midway between the navel and the umbilicus and is about the size of a small orange, hard and nodular. It is freely movable from side to side. There is no evidence of hemorrhoids. There is no glandular enlargement in any part of the body.

Operation.—Incision in the median line, four inches in length, above the symphysis pubis. On opening the peritoneal cavity

a tumor was found near the centre of the sigmoid, involving its entire circumference for a distance of three inches and being from two to three inches in diameter. It was very hard in consistency, evidently of the scirrhus type and accompanied by glandular involvement in the meso-sigmoid nearly as far as the vertebral column. About seven inches of the sigmoid and a corresponding amount of its mesentery, containing all the involved glands, were removed followed by end-to-end anastomosis. A small cigarette drain was inserted to the point of suture after the return of the intestine and a rubber tube was passed through the rectum to a point beyond the suture line. Closure of the abdominal wall.

Post-operative.—Scarcely any vomiting followed the operation. There was little if any reaction and the abdominal wound healed by first intention, the pulse never rising above 100. The drain was withdrawn on the third day and not re-inserted. The bowels moved on the fifth day to small doses of calomel and salts. At the end of the second week patient was placed on regular diet. At the time of discharge, patient says that he is entirely free from the pain of which he complained prior to the operation. The diarrhœa had ceased, the bowels moving regularly with slight discomfort.

Two years after the operation, patient reports that with the exception of occasional constipation, he is perfectly well. The microscopic examination of the growth shows it to be an adenocarcinoma.

Case 5.—P. H., aged sixty-five, referred by Dr. Niesley. Admitted to the hospital, February 3, 1904. Wife is said to have died of "cancer." Patient has always enjoyed excellent health. About four weeks ago, patient suffered from an attack of constipation with mild obstructive symptoms, which did not yield readily to catharsis. The last satisfactory movement occurred sixteen days prior to admission and since that time there have been only occasional small movements with the passage of gas after enemata. During this period there has been nausea with occasional vomiting and a variable degree of distention. There has been no loss of flesh and nothing abnormal in the character of the stool.

On examination, there is general endarteritis and moderate distention of the abdomen. No growth can be felt either through the abdominal wall or by rectum.

Operation.—Gas and ether. A median incision was made above the symphysis pubis and the peritoneal cavity opened. The sigmoid was examined and found in its upper part to be the site of a hard scirrhous growth with beginning glandular involvement. The intestine above the growth was moderately distended and congested. The growth involved the entire circumference of the gut. About four inches of the sigmoid and the contiguous mesentery were removed, followed by end-to-end anastomosis. Owing to the congested condition of the upper end, a small opening was made through its wall after the suture had been completed and a tube introduced toward the descending colon. It was thought that, by this means, the fecal current could be temporarily deflected until the congestion had subsided and the danger of leakage averted. The remainder of the abdominal incision was closed in the usual way.

Post-operative.—Patient developed considerable nausea and vomiting immediately after the operation, which, notwithstanding lavage, continued to his death. There was no abdominal pain, no rigidity or distention, and patient had several large soft fecal movements through the rectum within twelve hours after the operation had been concluded. There was no discharge of fecal material through the tube inserted into the descending colon until the second day. Patient died on the third day from heart failure due to the poor condition of his arteries.

Microscopic examination showed the growth to be an adenocarcinoma.

REMARKS ON CASES.

CASE I.—This case of strangulated hernia is of interest in that the gut, after the constriction was divided, was exposed for 24 hours beneath a temporary dressing before the question of gangrene could be determined. This same procedure was followed in a similar case reported in the Presbyterian Hospital report of 1902, in which the suspicious gut eventually proved viable. The delay in the completion of the operation in both cases did not seem to jeopardize the recovery of the patient.

The development of the fecal fistula was expected and was associated with no general constitutional disturbance. From the nature of the discharge an artificial anus would probably have resulted in the subsequent emaciation and star-

vation of the patient. As a matter of fact, the absence of any disturbance of nutrition in the present instance was due to the short duration of the fistula as well as to the fact that, even when at its height, a sufficient amount of intestinal contents passed down the normal channel to form movements of moderate size and frequency.

Examination of the affected segment showed a necrosis more advanced in the mucous membrane than in the serous coat. The lumen was partially filled with most offensive fluid material.

Case II.—The clinical features in this case of strangulated hernia are surely most atypical and unexpected. Notwithstanding that the contents of the sac were returned into the abdominal cavity by the gentle pressure of an ice-cap and by the raising of the foot of the bed without taxis or manipulation of any form, the primary constriction had been sufficiently severe to determine the gradual necrosis of the affected loop. That this should have taken place without local pain and with the presence of normal expansile impulse, with but slight nausea and attacks of vomiting separated by considerable intervals, with the almost daily movement of the bowels and with the frequent passage of flatus, is certainly most exceptional. As, however, the bowel became necrotic, paralysis of its muscle fibre led to the development of the symptoms of sub-acute obstruction. At the operation a small abscess was found, moderately circumscribed, containing bacilli coli communis, the result of the perforation which had taken place at one point of the constriction in the affected loop. Here again, because of the friable and congested ends of the gut and the presence of an abscess, a fecal fistula developed, but its prompt closure took place as the process of repair by granulation became advanced.

Case III.—This case of adeno-carcinoma in the small intestine is of interest because of its rarity and, secondly. because of the resemblance of its clinical features to those occurring in malignant disease of the stomach, the nausea and vomiting occurring regularly within a short time after eating. Examination of the stomach contents, however, showed nothing abnormal and physical examination detected the growth in the lower right side of the abdomen, except when it was temporarily absent in the pelvis.

The short existence of the symptoms prior to the admission of the patient into the hospital is a forceful illustration of the fact that these growths may reach an advanced stage of development before the first symptoms appear.

CASES IV AND V.—The clinical features of Cases IV and V are those of more or less typical carcinoma of the sigmoid. Here again the comparatively short duration of the symptoms must be noted.

In this situation, the subjection of the suture line to the mechanical irritation and pressure of solid fecal material warrants the insertion of the abdominal drain, although some protection is afforded by the passage of a tube into the lumen of the gut above the point of suture.

In the first case the result proved most satisfactory and the patient is still free from recurrence. In the second case, unfortunately the general condition of the circulatory system was chiefly responsible for the patient's death. The method had, however, proved its value in that at no time after the operation was there any evidence of leakage or peritonitis.

In conclusion, it seems desirable to call attention to the danger of subsequent leakage in end-to-end anastomosis when the resected ends of the intestine are unduly congested or friable. This seems to have been the cause of the patient's death in many of the cases reported in the current literature on this subject. That this unfortunate termination can sometimes be averted by the method here suggested seems reasonable. If, however, the abdomen is to be tightly closed without the safeguard of moderate drainage or of temporary anchorage of the affected loop to the parietal peritoneum, then side-to-side anastomosis with the closure of the resected ends by the purse-string suture seems to yield the most satisfactory results. If the condition of the resected ends is normal, however, end-to-end anastomosis without drainage (except in the sigmoid) can be adopted without fear of subsequent peritonitis.

A TRANSVERSE INCISION FOR THE REMOVAL OF THE APPENDIX.[1]

BY GWILYM G. DAVIS, M.D.,

OF PHILADELPHIA.

THE most popular incision at present for the removal of the appendix is probably that first described by Battle (*Brit. Med. Journ.,* 1895, ii, p. 1360) and later by Jalaguier (*La Presse Médicale,* 1897) and Kammerer (ANNALS OF SURGERY, 1897, xxvi, 225). It is made along the outer edge of the rectus muscle, and the skin being drawn toward the median line the anterior layer of the sheath of the rectus is incised longitudinally. The rectus is then displaced inwardly, and such portion of the sheath as may be present, and the transversalis fascia and peritoneum incised posteriorly. This operation was modified by Lennander (*Cent. für. Chirurg.,* 1898 xxv, 90) and Edebohls (*Med. Record,* 1899, p. 665) by going directly through the fibres of the rectus instead of drawing it to one side and the method is used at least by many for all kinds of cases, suppurative and otherwise.

The operation of McBurney (ANNALS OF SURGERY, 1894, vol. xx, p. 38) is also frequently used. He made an incision four inches long in the direction of the fibres of the external oblique about one inch from the anterior superior spine crossing a line drawn from it to the umbilicus nearly at right angles. One third of the incision is above this line. The external oblique fibres were divided in the line of the skin incision and the internal oblique and transversalis fibres parted in a direction nearly at right angles to those of the muscle above.

Harrington (*Boston Med. and Surg. Jour.,* Aug. 1899) and Weir (*Med. News,* Feb. 17, 1900, 241) suggested continuing the separation of the internal oblique and transversalis inward by dividing the sheath of the rectus and pulling it toward the median line. This was done in order to obtain additional room in cases in which the McBurney incision had

[1] Read before the Philadelphia Academy of Surgery, October 2, 1905.

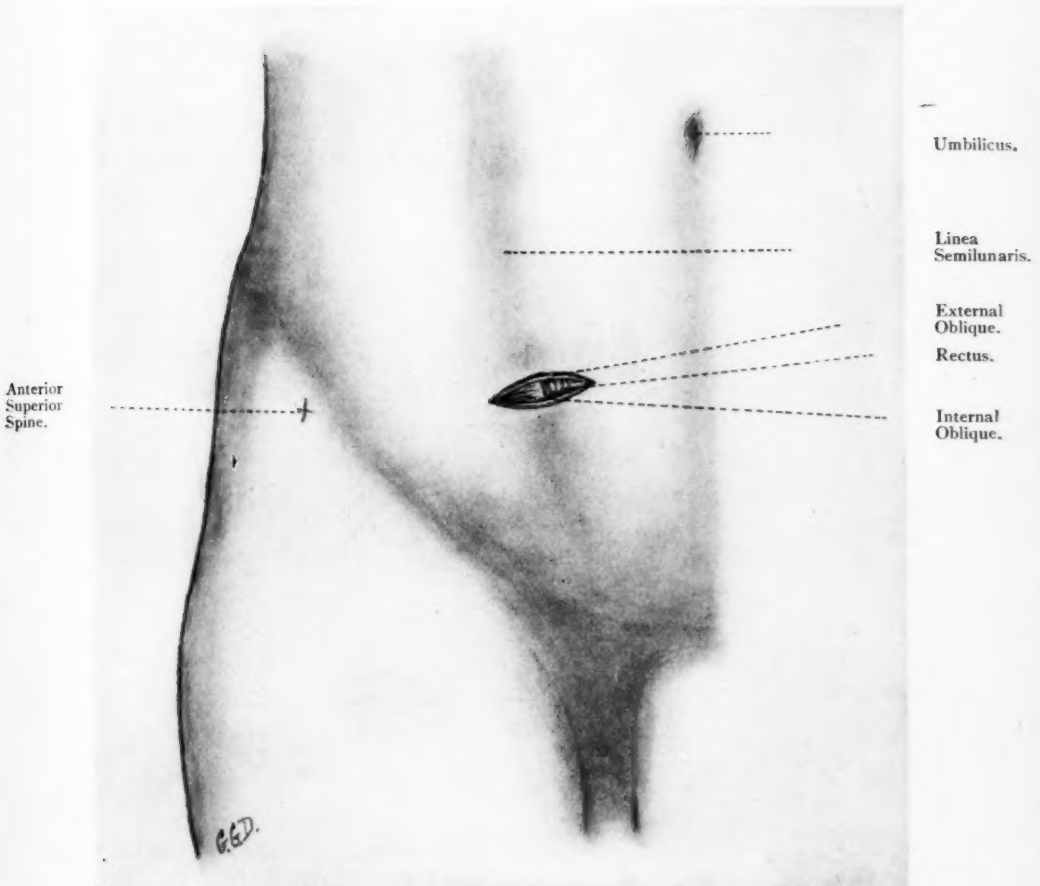

FIG. 1.—Small incision for simple cases.

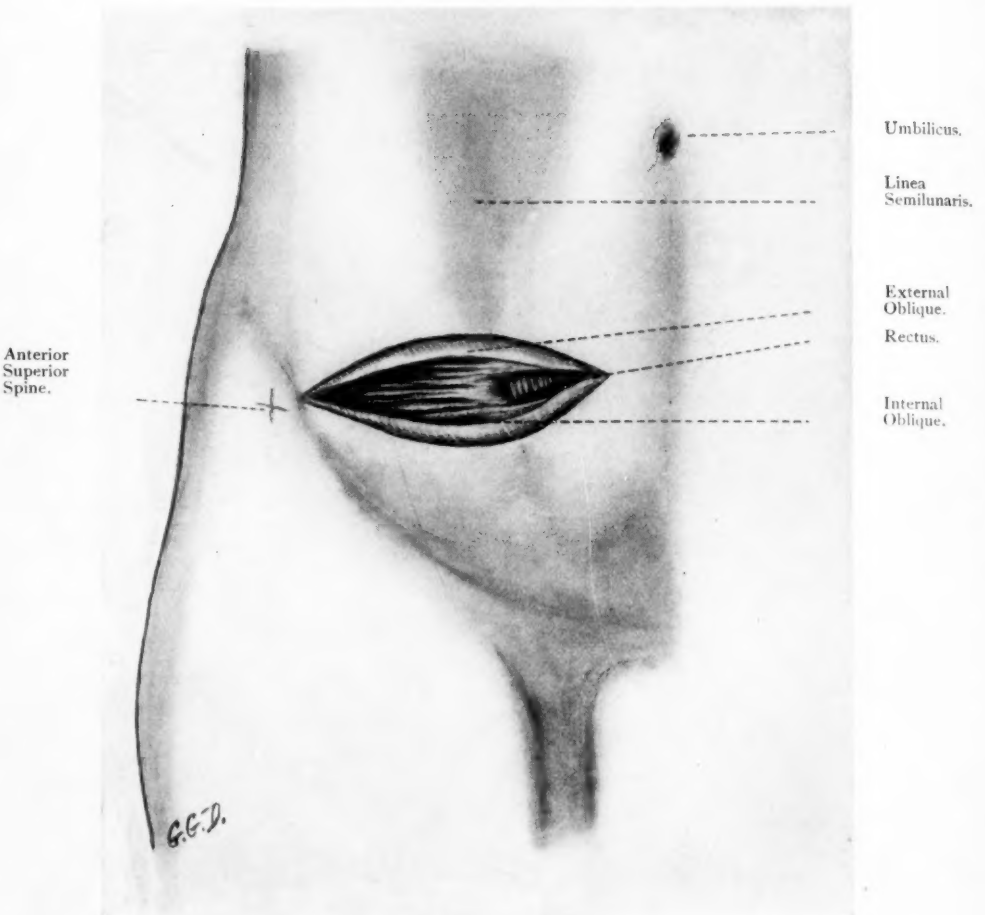

FIG. 2.—Large incision for difficult cases.

been found to be insufficient. Quite recently I have come across the paper of J. W. Elliot, (*Boston Med. and Surg. Journal,* 1896, vol. ii, p. 433) which seems to have been overlooked by most surgical writers. He made his incision beginning at half an inch inside of the linea semilunaris. The external oblique was divided in the line of the skin incision and the internal oblique and transversalis were divided in the direction of their fibres and in the line of the incisions above. If more room was desired he suggested that the incision could be prolonged along the linea semilunaris or into the rectus muscle if necessary.

It is thus seen that there are three ways of operating—one through the sheath of the rectus longitudinally, another by McBurney's operation with the Harrington and Weir addition and the third the transverse incision of J. W. Elliot through the external and internal oblique and transversalis muscles.

Of the longitudinal incision of Battle and its modification of going directly through the rectus the former seems the better for the following reasons: The incision through the muscle weakens it at this point. In Battle's operation the rectus presents an intact muscle to resist the inside pressure and the incisions through the sheath are overlapped by the muscle slipping back into place. In the modified operation there is left a straight scar from the skin to the peritoneum. Division or parting of the muscle is certain to wound some of the branches of the deep epigastric artery or even sometimes the main trunk. This is more apt to be the case if the fibres are parted from above down than from below up. In longitudinal incisions generally the nerves supplying the rectus are liable to be cut through as well as the vessels. These nerves are motor in character as well as sensory and come from the tenth, eleventh and twelfth intercostals. If cut they, like other motor nerves, do not tend to unite. If large incisions are needed the amount of muscle paralyzed is considerable. If drainage is used it is brought out directly through the lower angle of the wound and it is needless to point out how favorable this is to the production of hernia.

Paralysis of a part of the rectus is recognized by, first, the operated side of the abdomen protruding more than the sound

side and, secondly, by observing that when the rectus contracts the scar is dragged up by the uninjured part of the muscle while the paralyzed lower portion offers no resistance. Another objection to incising the sheath of the rectus pointed out to me by Dr. Porter is that infection may travel along beneath it instead of coming up to the surface. McBurney's operation is good in easy cases but in difficult and suppurative operations it does not give sufficient room and makes a nasty wound if infected and unsuitable for efficient drainage. The operations of Harrington and Weir possess all the objections of the McBurney with the exception of the slight additional space gained by displacing the rectus.

Proposed Incision.—For easy cases the incision is made directly transverse one and a half inches long. Its center is to be on the semilunar line on a level with the anterior superior spine. The aponeurosis of the external oblique is divided in the line of the skin incision but obliquely to the direction of its fibres. The fibres of the internal oblique and transversalis muscles are parted—not cut—in the same line as the structures above. The peritoneum is then opened and the incision carried inward through first the anterior layer of the sheath of the rectus. A blunt retractor three-quarters of an inch wide is then inserted and the muscle drawn toward the median line. This exposes the transversalis fascia and peritoneum posteriorly which are then also divided. Thus is obtained a triangular opening with its base of three quarters of an inch and two sides of about an inch long which is ample for simple cases.

For Difficult Cases.—If the case is a difficult one the outer end of the incision is prolonged to the anterior spine or even above and inwardly through the sheath of the rectus to within an inch of the median line. This will give an opening four to five inches long according to the size of the patient, sufficiently large to insert the hand if necessary and through which the appendix can be extracted under almost all circumstances.

The operation was developed as follows: Previous to about eight years ago the incision parallel to Poupart's ligament dividing all structures in the line of the skin incision was used. About that time, desiring to avoid the transverse division of the muscular fibres of the internal oblique and transversalis, the incision was made higher up on the abdomen,

practically Elliot's operation. It began where a line from the femoral artery to the umbilicus crossed the linea semilunaris (about opposite the ant. sup. spine) and went outward and slightly upward toward the crest of the ilium. In cases requiring a large incision room was obtained outwardly and the ascending branch of the circumflex iliac artery was divided. It was to avoid doing this that for the past two years the incision as above described has been used. The center of the incision on the linea semilunaris opposite the anterior spine is almost over the base of the appendix. Sometimes it is higher, more rarely it is lower, in either case it is easily within reach. The ileo cæcal junction lies three-quarters of an inch above the base of the appendix so that one serves as a guide to the other. The incision is designed to avoid wounding arteries. The deep epigastric always enters beneath the edge of the rectus muscle below the level of the anterior superior spine and its main trunk is out of the way. To divide and ligate the epigastric vessels as suggested by Weir appears to be an objectionable and unnecessary procedure. As the deep epigastric proceeds upward it lies on the under surface of the muscle at about its middle or often a little toward the outer side, sending branches to each side, the larger ones going outward. They are usually drawn aside when the muscle is retracted even in extensive operations.

At the outer angle of the wound no vessels will be divided unless the incision is carried upward and backward beyond the anterior spine as the ascending branch of the deep circumflex iliac is given off and proceeds upward just above the anterior spine. As the deep muscles are divided in the direction of the nerves these are not injured as occurs in longitudinal incisions through the rectus. The appendix in this incision is particularly accessible because its center lies almost over the base of the appendix. In the longitudinal incisions through the rectus they lie to the inner side of the base of the appendix and if it points to the right and is retro-cæcal the operator encounters the objection pointed out by McBurney of having to work outward under a shelf of tissue made by the outer margin of the wound.

In cases in which drainage is necessary the drain is brought out at the outer angle of the wound and lies close to

the bony anterior superior spine and passes through the thick muscular mass of the internal oblique and transversalis, all of which ensures against the formation of a hernia at that point.

The inner portion of the wound is protected absolutely against hernia by the rectus muscle, and to its outside there are the thick internal oblique and transversalis muscles beneath, and above them the aponeurosis of the external oblique. The aponeurosis of the external oblique does not blend with the sheath of the rectus at the linea semilunaris but joins it at about one-third of the distance between the linea semilunaris and the linea alba. The division of the external oblique aponeurosis obliquely instead of parallel to the direction of its fibres may be urged as an objection but this is more than compensated for by the better access which is afforded. No hernias have come under my observation even in suppurative cases.

THE RADICAL CURE OF DIRECT INGUINAL HERNIA.[1]

BY GWILYM G. DAVIS, M.D.,
OF PHILADELPHIA.

THE radical cure operations for both oblique inguinal and femoral hernias are fairly well understood and satisfactory. Direct hernia is much less frequent, not so well understood and not infrequently its operative treatment is quite difficult and not always satisfactory. The direct hernias which have come under my notice have presented themselves in two forms. One form pushes its way through the conjoined tendon and comes out of the external ring. It possesses as its coverings the peritoneum, sub-peritoneal fat, transversalis fascia and thinned conjoined tendon, and intercolumnar fascia, all usually more or less matted together. The other form bulges around the outer edge of the conjoined tendon and gradually decreases in size as it extends out toward the deep epigastric artery. It is pear shaped rather than spherical in form.

In this form we might expect to see the remains of the obliterated hypogastric artery going over the sac, but I have seen no evidence of it: possibly it has been pushed to the inner side behind the edge of the rectus muscle. It is recognized that when muscular and tendinous tissues are thick and abundant the operations for the radical cure of hernia are quite satisfactory and easy of performance. It is just the opposite condition that is confronted in direct hernia. The relation and construction of the conjoined tendon should be borne in mind. This tendon which is formed by the fusing together of the aponeurotic tendons of the transversalis and internal oblique muscles at the linea semilunaris passes over the rectus muscle and is almost immediately joined by the aponeurosis of the external oblique to form the sheath of the rectus. Thus it is seen that the insertion of the conjoined tendon and sheath of the rectus

[1] Read before the Philadelphia Academy of Surgery, October 2, 1905.

are practically the same. The sheath below the fold of Douglas is entirely in front of the muscles. Posterior to the muscle is transversalis fascia only. As the sheath descends it inserts into the crest of the pubis its spine and a short distance—about an inch—along the ileo pectineal line. The outer or lower edge of the conjoined tendon (sheath of rectus) fuses into and blends with the transversalis fascia as it goes out to the deep epigastric artery. This being the case the conjoined tendon has no free edge unless it is made by the knife dissecting it away from the transversalis fascia beneath.

Below, lying on Poupart's ligament is the spermatic cord covered by the fibres of the cremaster. The cremaster is nothing more than the lower edge of the muscular fibres and connective tissue of the internal oblique continued down over the cord.

In performing a radical cure of oblique hernia these cremaster fibres are sometimes quite abundant and may, as I have done, be utilized in closing the canal, but in direct hernia they are apt to be too scanty to be of any service. In oblique hernia the gap from the deep epigastric artery to the spine of the pubes is closed by bringing down the internal oblique muscle and conjoined tendon and sewing them beneath the cord (Bassini) to Poupart's ligament; but in direct hernia these tissues are so scanty that they are insufficient for the purpose. The suggestion of Halsted to take a flap from the sheath of the rectus and turn it outward I have never tried. The usual method resorted to to reinforce this weak spot is that of Wölfler and Bloodgood of opening the sheath of the rectus and dragging its fibres outward and sewing them to Poupart's ligament. The incision for exposing the rectus is shown in Fig. 1. The external oblique has been turned back exposing the internal oblique. The conjoined tendon is drawn up and in by a retractor introduced beneath it out toward the muscular fibres. The incision is then made from the muscular fibres toward the spine of the pubis. This incision is practically made through the lower edge of the conjoined tendon because this latter fades away into the transversalis fascia in the direction of the deep epigastric artery. The transversalis fascia is then pushed back from the posterior surface of the rectus and the conjoined tendon (sheath of the rectus) raised up from

FIG. 1.—Showing incision from muscular fibres of the internal oblique to the spine of the pubis, to expose the edge of the rectus muscle

FIG. 2.

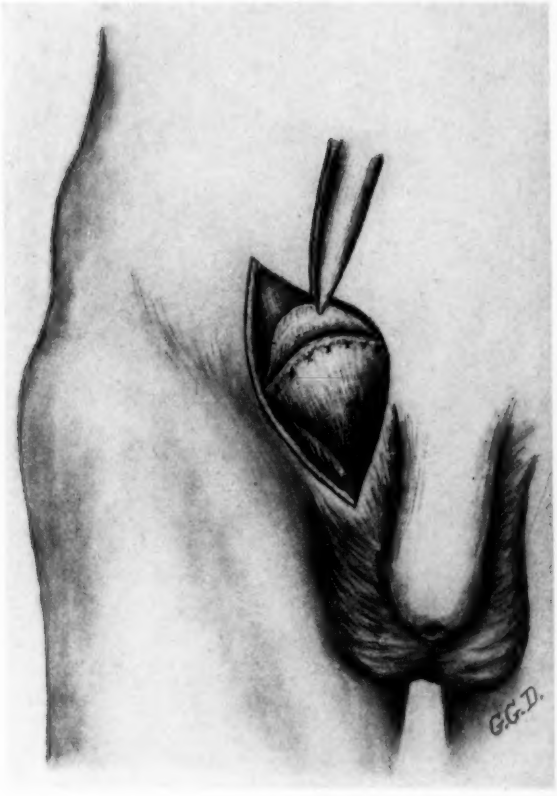

Fig. 3.

Fig. 4.

its anterior surface. Personally I have not been able to draw the rectus as far out as Bloodgood advises.

After having transplanted the rectus as far out as possible then the arching fibres of the internal oblique and conjoined tendon are to be brought down and sutured to Poupart's ligament beneath the cord as in Bassini's operation. The external oblique is then sutured as desired (overlapped or not) over the cord.

In operating on the other form of direct hernia an entirely different state of affairs is presented. The rounded hemispherical tumor presents itself just above the position of the external ring with the cord below. One of two conditions will be found. Especially when the hernia is an old one the hernial coverings from the intestine within to the superficial fascia without will be a single thick strong membrane incapable of being separated into layers. When such a condition is found in several cases I have divided the sac transversely and overlapped its two parts, suturing the apex of the lower flap to the base of the upper and then bringing down the upper flap and suturing it in place as is done in the Mayos' operation for umbilical hernia. They dissect off the peritoneum but I believe it is better not to do so because it is firmly blended with the other tissues and adds considerable to the strength of the flaps, whereas alone it is too weak to be of much service. (See Figs. 2 and 3.)

In some other cases the peritoneum is not adherent to the conjoined tendon and intercolumnar facsia in front but has a layer of fat between. When such is found, the fat may be scraped away and the two laid together and treated as a single layer and overlapped as already described or some other method may be resorted to. The treatment of these direct hernias is not entirely settled and different methods must be used for different conditions. As the overlapping plan has been found to work satisfactorily in cases of oblique inguinal hernia (Andrews) and umbilical hernia (Mayo) so I believe will it also be found of value in certain cases of direct inguinal hernia.

THE RADICAL CURE OF SEVERE FEMORAL AND INGUINAL HERNIA.

BY JAMES H. NICOLL,

OF GLASGOW,

Professor of Surgery in the Andersonian College.

THE method of operating here dealt with is applicable to both femoral and inguinal hernia. Its main features are:

(*a*) The employment of the sac to form an intra-abdominal buttress over the internal aspect of the hernial opening or ring; (*b*) the use of the pubic ramus as a *point d'appui* in the process of closure of the hernial canal, and (*c*) the additional security of closure obtained by the superposition on the bone sutures of a plane of fascial sutures.

Its application to femoral hernia was described in the *British Medical Journal* of November 8, 1902, with a modification described in the *Scottish Medical and Surgical Journal* of December, 1903. Its employment in inguinal hernia was described briefly in 1905, and is here published for the first time ***in extenso.***

It is not a difficult operation, and whatever extra work is involved in the drilling of the bone is compensated for in the firm closure secured in the hernial canal. In looking to results obtained, it is necessary to differentiate in the cases treated as between cases not specially severe, on the one hand, and severe cases on the other. In ordinary cases the method gives results as good as, but no better than, many of the methods in use. In severe cases, cases of large hernial aperture, of lax and atrophic parietes, or high intra-abdominal tension from omental corpulence, the method, with its double closure of the canal by bone suture, followed by musculofascial suture, attains a high degree of security. In femoral hernia I have of late employed the method in practically all cases, though at first designing it for severe cases only. In inguinal hernia I

have as yet made use of it only in severe cases, finding other and simpler methods answer for ordinary cases.

Femoral Hernia.—Of formal operations for femoral hernia there are many. The simpler operations include the "purse-string" suture of Cushing, Fortunato,[1] Curtis,[2] and others, popularized by Coley,[3] the well-known operation of Kocher, and the more or less similar suture operations of Bassini,[4] Franz,[5] Fabricius,[6] Bottini,[7] and others. What may be termed "flap" operations comprise the osteoperiosteal flaps of Trendelenburg and Kraske,[8] the musculofascial (pectineal) flaps of Watson Cheyne,[9] Saltzer,[10] Prokupin,[11] and others, and the adductor longus flap of Schwartz.[12] Operations by approach from above include intra-abdominal closure of the ring by laparotomy, and by way of the inguinal region (Ruggi,[13] Nasi,[14] Parlavecchio,[15] and Tuffier). With these last may be included closure of the femoral canal by the employment of the fascia transversalis (Buonamici),[16] and the method of Lotheissen,[17] or (*vide* Kammerer[18]) the Lotheissen-Gordon[19] method, in which the conjoint tendon of the internal oblique and transversalis is attached to Cooper's ligament.

The following is the technique of the operation I employ:

A. *Obliteration of the sac*, also of the peritoneal depression over the abdominal aspect of the ring, and the substitution of a buttress over the internal aspect of the ring:

1. Expose the sac, and clear it from surrounding tissues (the skin incision may be vertical or transverse).

2. Open the sac longitudinally in its middle line, and clear of contents.

3. Separate it from parts surrounding its neck, including the transversalis and the iliac fasciæ for one inch round the abdominal aspect of the ring.

4. Bisect the sac longitudinally from fundus to neck (Fig. 1).

5. Make an aperture in one half near the neck (Fig. 1).

6. Interlock the halves by putting the other through the aperture (Fig. 2). In certain cases it lies better if previously twisted one half-turn on its longitudinal axis.

7. Reduce the whole sac through the femoral ring into the extraperitoneal space previously cleared for it by detaching its neck from the abdominal aspect of the ring. The sac thus lies bunched up within the abdomen, between the peritoneum and the transversalis and iliac fasciæ over the internal aperture of the femoral canal.

Where the sac is unnecessarily large, part of it may be cut away before reducing it through the canal.

B. Closure of the *Femoral Ring:*

1. Carry an incision (bone-deep) from the femoral vein along the pubic ramus to the region of the pubic spine. This

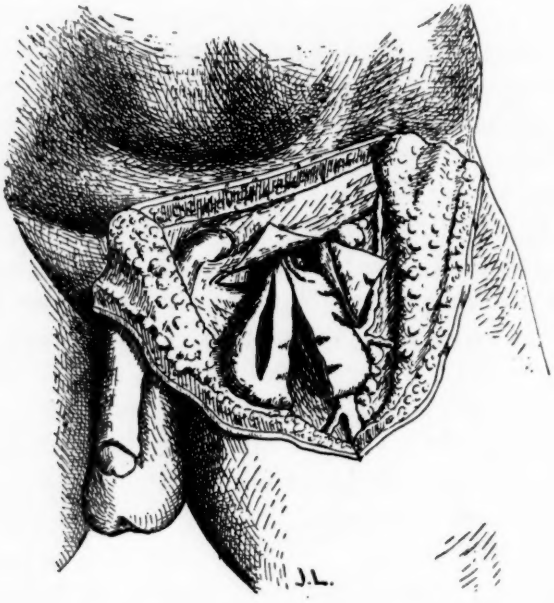

FIG. 1.—Sac emptied, detached from surrounding parts, including internal aspect of abdominal wall for one inch round femoral ring; split longitudinally, and one half incised for passage of the other.

divides the pubic portion of the fascia lata, the origin of the pectineus, and the periosteum. Its length will depend on the extent to which the femoral vein has been displaced outward by the presence of the hernia, and will vary from one inch to one inch and a half.

2. Detach the periosteum to a limited extent, and retract it.

3. Drill the bone near its upper edge in two places one-half inch to one inch apart (one drill-hole may be made to suffice). Any bone drill or punch may be used. In the illustration (Fig. 3), the simple hand drill and the tongue depressor used as a protecting spatula are those I commonly employ.

4. Pass through one of the apertures a loop of stout catgut, or other absorbable ligature (Fig. 3). This may be passed by threading it in the eye of a curved surgical needle, or by

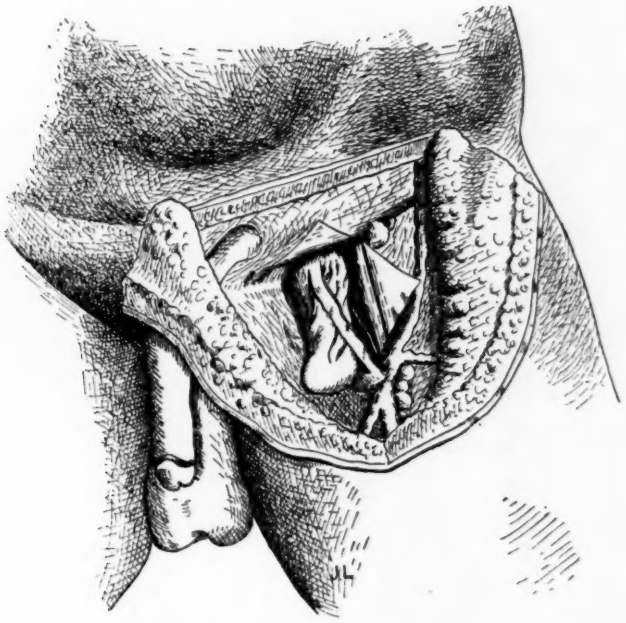

FIG. 2.—Sac ready for reduction, with halves interlocked. (The situation of the aperture in the sac in Figs. 1 and 2, and the relative positions of the two halves of the sac in Fig. 2 are not, in the interests of semidiagrammatic clearness in the drawings, quite those of actual practice.)

pushing it through, simply doubled on itself. It is, however, more easily passed by threading it in the eye of the bone drill or in the eye of an ordinary surgical probe. For the purpose, I employ a special probe in which the eye is small and placed very near the extremity of the handle (Fig. 4). The advantage of that shape and position of the eye will be obvious to

those familiar with drills for wiring fractures, or to any one in his first performance of this operation. With such a probe the operation is of the simplest; without it, some difficulty may be experienced in passing the suture through the aperture. The probe should be of the ordinary pliable type.

5. Divide the loop of ligature. Thread one end in a large curved surgical needle and pass it as a mattress suture through Poupart's ligament. Unthread it from the needle (Fig. 4).

Repeat this with the second end, carrying it through Pou-

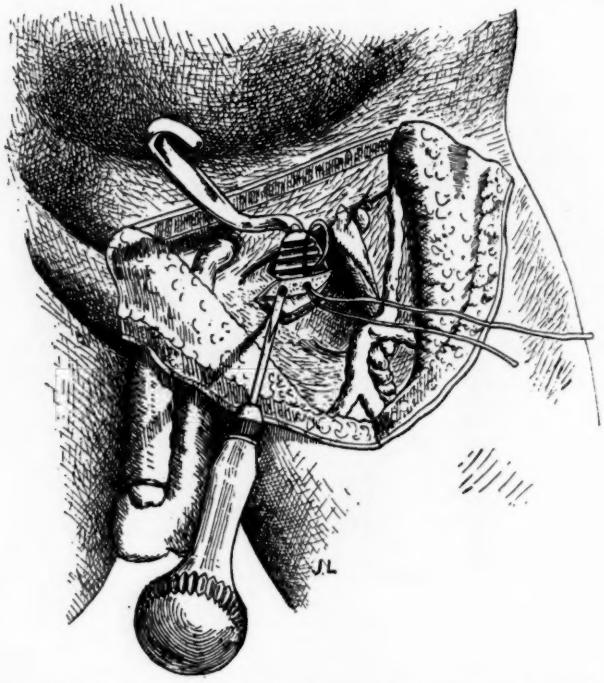

FIG. 3.—Closure of ring; drilling of bone; looped catgut suture passed through first drill-hole.

part's ligament at a higher level (Fig. 4), avoiding the deep epigastric artery to the outer side, and, in male patients, the spermatic cord above. (In very large herniæ, the loops, instead of being placed the one directly above the level of the other, as figured, may be made to diverge in the ligament so as to "gather in" the margin of the aperture.)

6. By means of the probe (into the eye of which the ends

are threaded) withdraw both ligatures through the second drill hole in the bone (Fig. 4). It is in this part of the operation that the special probe is of particular advantage, even if the common device of the loop tractor indicated in Fig. 9 be adopted.

7. Tie the ends of each loop separately over the front of the bone, thus bringing Poupart's ligament down to the posterosuperior surface of the bone and fixing it firmly in contact with that surface, constituting what is in effect an extension

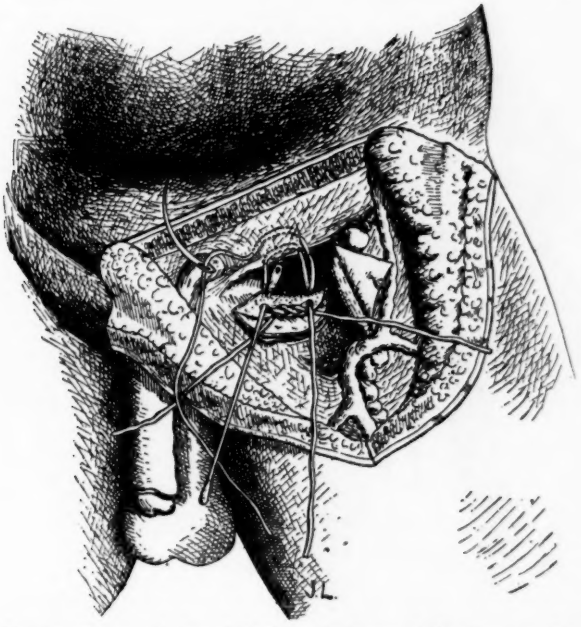

FIG. 4.—Closure of ring; placing of the loops in Poupart's ligament, and return of the ends through second drill-hole. (One loop tied loosely to indicate action in pulling Poupart's ligament down to posterosuperior aspect of ramus of os pubis.)

outward of Gimbernat's ligament, and absolutely closing the femoral ring to whatever extent may be desired, due regard being paid to the amenity of the femoral vein. The degree of occlusion is regulated by the position of the sutures in Poupart's ligament, but not by the tension with which they are tied. This latter does not vary, the knots being tied in all cases firmly to bring the ligament into contact with the bone (Figs. 4 and 5).

8. To make the closure doubly secure, complete the operation by uniting, by interrupted catgut sutures, the detached margin of the pectineal origin and the pubic portion of the fascia lata to the "anchored" Poupart's ligament (Fig. 5).

REMARKS ON THE FOREGOING DESCRIPTION OF THE FEMORAL OPERATION.

Method of Treating the Sac.—The manœuvre of returning the emptied sac through the canal of a hernia is not new. While descriptions of such operations may be found far back

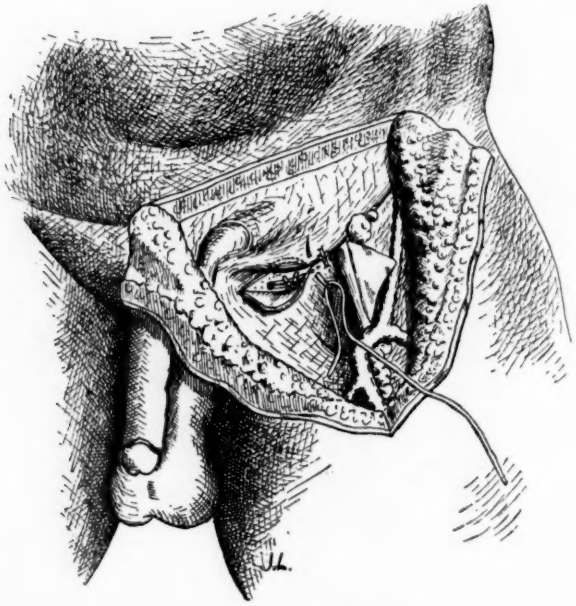

FIG. 5.—Closure of ring; bone sutures tied; completion of closure by suture of fascia lata and pectineus to the fixed Poupart's ligament.

in surgical records, the practice was first put upon a formal footing by Sir William Macewen, and to his advocacy is due the general recognition of the great value of the buttress formed over the abdominal aspect of the ring by the puckered-up sac. Macewen, as is well known, puckers up the sac by a "gathering" suture which, passed through the hernial canal and out through the parietes, is made the means of puckering up the sac on the abdominal aspect of the ring. Variations of

the technique by which Macewen's object is attained have been introduced by other surgeons (*vide*, for example, the operations of Davis [20] and Packard,[21] and the method described above is but one of these variations.

The Absence of All Sutures in the Sac has Three Advantages:

1. The obvious saving of time.

2. Avoidance of the recognized risk of strangulation, and consequent sloughing, of the puckered-up sac in the grasp of the ligature.

3. The facility with which the entire sac may be placed within the abdomen. A suture emerging from the neck of a large sac may, while pulling the neck within the abdomen, by anchoring it to the parietes leave the bulky fundus blocked in the canal. The absence of a suture permits the interlocked sac to be pushed as far within the abdomen as may be desired.

Against these advantages there is to be placed, I believe, one disadvantage, and that a minor one, involved in the absence of suture, namely, that the fixing of the sac in position depends on the tying of the sutures closing the ring, and not upon a special sac suture, and that, therefore, it is necessary, particularly in cases where the patient has "strained" between the placing of the sac and the tying of the ring sutures, to verify and, if need be, adjust the position of the sac before tying the sutures closing the ring. Once tied, these sutures close the ring absolutely, and no prolapse of the sac into the canal is possible. In femoral hernia I have never seen any tendency of the sac to prolapse before closure of the ring, but I have seen it in several cases of inguinal hernia. The explanation may lie in the fact that the inguinal rings are more freely affected by "straining" or deep respiration than is the femoral.

Method of Closure of the Femoral Aperture.—In the first description given of the operation (Glasgow Pathological and Clinical Society, April 14, 1902), I stated that, in looking into the literature of the subject, I found that Roux [22] had also been carrying out in the closure of the ring the idea of

attaching Poupart's ligament to the bone, though employing a different method to attain that end, namely, the use of a U-shaped metal nail driven through the ligament into the bone; and that it was somewhat surprising that a further search (so far as the regrettable decease of the invaluable *Index Medicus* permitted such to be made) should have revealed no other references to the utilization of so conveniently placed a *point d'appui* as is offered by the pubic ramus for the closure of the femoral ring on the classic principle of restoring its boundaries to their correct, or to an over-corrected, position.

The method of closing the ring above described, and which I had been practising for some time before I learned of Roux's independent work, is, in my probably too partial opinion, preferable to that adopted by Roux, for the following reasons:

1. Roux's operation involves the introduction of a metal foreign body. The subsequent removal of this, if desired, involves a second operation, with the risk of detaching the ligament from the bone in withdrawing the nail. Its permanent retention, on the other hand, involves the chance of the loosening of the nail by absorption (possibly necrosis) of the bone, as occurs not infrequently with wire sutures in fractures. Should this occur, and the nail become dislodged from the bone by the natural pull of Poupart's ligament or otherwise, a state of matters is established in which every movement of the thigh or abdomen would menace the femoral vessels and the peritoneum with puncture by the points of the nail.

2. The method of suture employed in the operation I have described brings Poupart's ligament down to the posterosuperior surface of the bone, attaching it there in the region of the ileopectineal line on the plane of Gimbernat's ligament, constituting virtually an artificial extension of that ligament. The effect of such an attachment, as a study of the anatomy of the region will show, is to occlude the femoral aperture at its extreme upper (inner) end (the plane of Gimbernat's liga-

ment), thus shutting its mouth, instead of closing its throat as the attachment of Poupart's ligament to the superior or anterosuperior surface of the bone does.

3. By varying the position of the two mattress loops of ligature, or by making them diverge, in Poupart's ligament, it is easy to effectually close the largest femoral ring without exerting pressure on the femoral vein. The tension of the femoral sheath may be regulated with precision.

4. Roux's nail attaches Poupart's ligament to the peri-

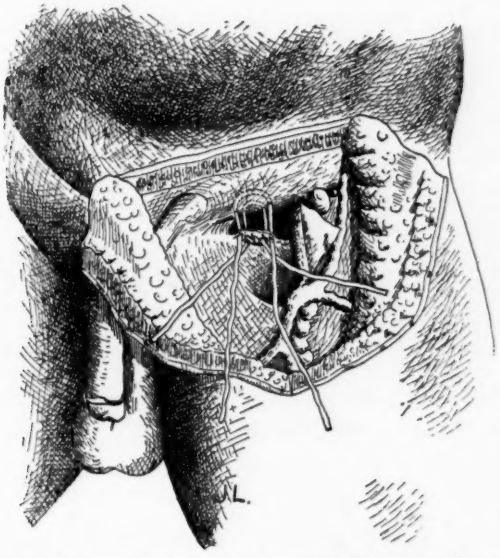

FIG. 6.—Modification of femoral operation. Anterior lip of periosteal incision raised in the form of a short periosteo-fascial flap through which the sutures have been passed.

osteum. The operation above described attaches it independently to both bone and periosteum.

5. The second plane of (musculofascial) sutures affords an additional security in the closure which Roux's operation does not possess.

Modification of Operation.—The following modification is not intended as a regular substitute for the second part of the operation, the closure of the femoral canal. In effect it is less secure. It affords the means, however, of attaching

Poupart's ligament in the desired position in cases where the operator is not supplied with a drill, as when hurriedly called to operate in a case of strangulation.

The sac having been reduced into the abdomen, and Poupart's ligament pushed back with a spatula, an incision is carried along the posterosuperior aspect of the pubic ramus from the femoral vein to the pubic spine (or part of that distance). This divides the periosteum. Its anterior lip is then raised to a slight extent by any convenient elevator, such as

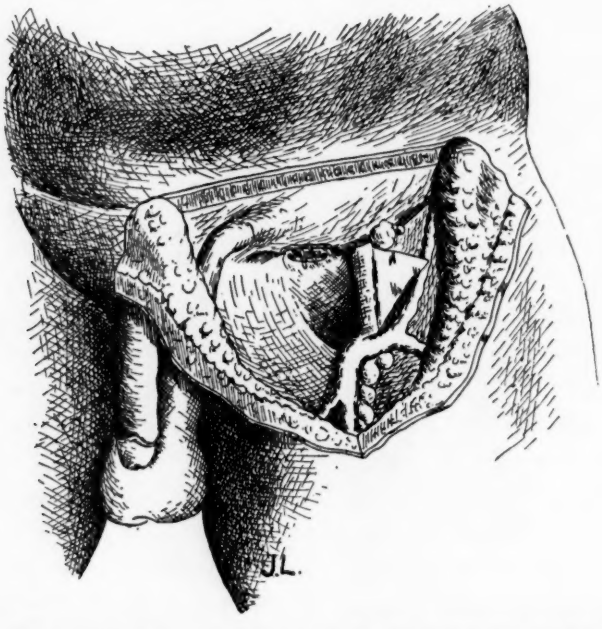

FIG. 7.—Modification of femoral operation. Suture knots tied on anterior (outer) aspect of anterior lip of periosteal incision, thus lodging the free margin of Poupart's ligament in the periosteal incision.

N. B.—In Figs. 6 and 7 the periosteal lip or flap is necessarily represented as raised too extensively, and, therefore, too long.

the flat end of an ordinary probe bent to a suitable angle or the blade of a pair of curved scissors. The effect of this is to form a short periosteofascial flap, the size of which has, for the purposes of illustration, been exaggerated in Fig. 6.

With an ordinary curved surgical needle the catgut suture is carried through Poupart's ligament, divided, and the ends,

again threaded in the needle, successively passed into the periosteal incision and out again through its anterior lip (Fig. 6). The tying of these ends lodges the free margin of Poupart's ligament in the periosteal incision on the posterosuperior aspect of the bone, thus closing the canal (Fig. 7).

As already mentioned, the closure thus obtained is less secure than that resulting from the bone suture method. Further, if the periosteal incision be made too long, or the anterior lip be raised as far as it, necessarily, has been in the illustrations, the result will be the attachment of Poupart's ligament, not to the posterosuperior, but to the superior surface of the bone, a much less efficient attachment.

Inguinal Hernia.—As applied to inguinal hernia, the method, as stated above, has in cases of ordinary severity probably no advantages over any of the many other methods in use. In severe cases, however, the combination of internal buttress, bone sutures, and superimposed musculofascial sutures involved in the method secures a closure of the aperture more absolute than can *in such cases* be secured by probably any other method. For it must be recollected that in practically all the known methods of operating for inguinal hernia, the *point d'appui*, whether the sutures are carried through the structure itself, or through other structures attached to it, is Poupart's ligament. The old, large, "severe" inguinal hernia rests on a Poupart's ligament which has stretched into a thin lax band sagging loose in a downward curve between its points of support at pubic crest and iliac spine. What in its normal condition constitutes an efficient fixed support on which the closure of the canal may be securely made, becomes, when stretched in an old severe hernia, considerably less efficient for the purpose. One of the main ideas concerned in the application of this method to inguinal hernia is to reinforce in such cases the defective Poupart's ligament by the backing of the pubic ramus.

The technique of the operation in inguinal hernia is as follows:

A. *Obliteration of Sac, and Formation of Intra-abdomi-*

nal buttress.—The treatment and final bestowal of the sac are carried out as in femoral hernia, and the terms of the description given in that case may, *mutatis mutandis,* be applied to inguinal hernia (Fig. 8), the sac being lodged over the internal aspect of the internal inguinal ring as a pad resting between the parietal peritoneum, on the one hand, and the fascia transversalis on the other.

B. *Closure of the Inguinal Canal:*

1. With blunt retractors pull the spermatic cord (or round

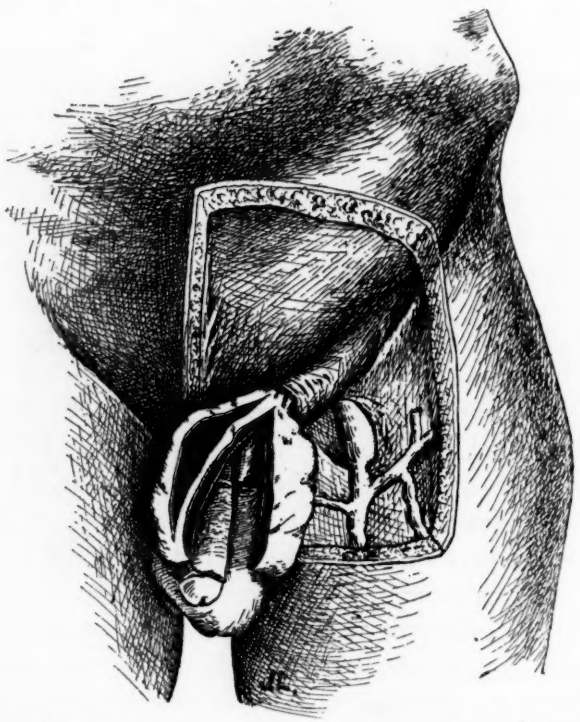

FIG. 8.—Sac emptied, detached from surroundings, bisected, and incised for interlocking and reduction.

ligament) upward and Poupart's ligament downward. The lax condition of the latter in cases of severe hernia permits free retraction, affording space not indicated in a dissection of the normal region.

2. Carry an incision along the superior aspect of the pubic ramus. This divides the iliac fascia, the origin of the

pectineus, and the periosteum. Its limits are the pubic spine and of the femoral sheath.

3. Slightly detach both margins of the periosteal wound.

4. Drill the bone, near its upper margin, in two places, one-half to one inch apart. The drill-holes are situated somewhere between the pubic spine and the femoral sheath, their exact position varying with the shape and size of the hernial aperture. The drill may be applied to the bone above the level

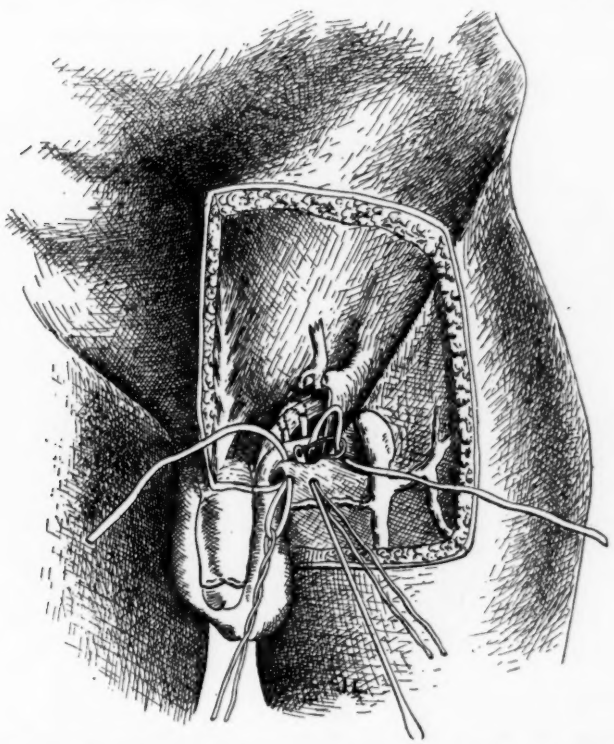

FIG. 9.—Closure of canal; bone drilled; mattress suture placed in internal pillar, and withdrawn through drill-holes by probe and loop-tractor.

of the retracted Poupart's ligament, in cases in which that is sufficiently lax to afford the necessary room for passing the drill *transversely* through the bone. In cases in which that is not so the drill should be applied to the anterior surface of the bone below the level of Poupart's ligament, and, in consequence, after perforating the pubic portion of the fascia lata.

Transverse perforation of the bone is essential. Oblique perforation places the internal apertures of the drill-holes far down on the posterior aspect of the bone, and more or less inaccessible. (*Vide*, also the position of the ligature knots, as described below.)

5. Pass a stout absorbable ligature, in the form of a large mattress suture, through the internal pillar of the hernial aperture. It is essential that this should have a "good bite" of the conjoined tendon and of the fascia transversalis (Fig. 9). It may or may not include the external oblique. During

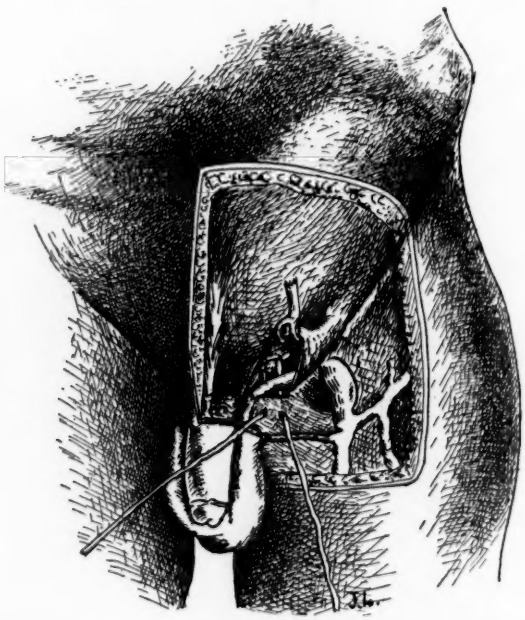

FIG. 10.—Closure of canal; suture, traversing internal pillar, and drill-holes in bone, ready for tying. The suture, here represented single, is commonly used double, each loop being tied separately.

the placing of the suture, the peritoneum is protected by the finger passed through the canal into the extraperitoneal fat behind the internal pillar. While indicated in the illustrations as single, the ligature should be double (*vide* Figs. 3 and 4), the loops being placed one above the other.

6. Pass the ends of the sutures out through the holes drilled in the bone. Of various methods of doing this, the

most expeditious are either the special probe indicated or the loop tractor (Fig. 9).

The sutures may pass in front of the spermatic cord or behind it (Fig. 10), as may seem best to secure firm closure of the canal without undue compression of the cord. In the event, the cord will occupy in the former procedure the position of the direct inguinal hernia, in the latter that of the oblique variety.

7. Tie the ends of the two loops of ligature separately.

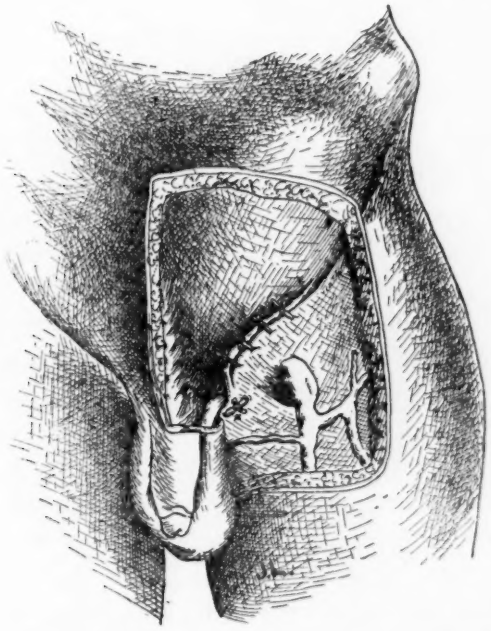

FIG. 11.—Closure of canal. Poupart's ligament sutured to the internal inguinal pillar.

The tightening of the knots brings the internal pillar down into the periosteal incision and lodges it firmly against the bone.

The position of the knots may vary. In Figs. 9 and 10 the ends of the suture, after having been passed out through the drill-holes in the bone, have been carried from within outward through the pubic portion of the fascia lata below the level of Poupart's ligament, and (Fig. 11, x) tied there, on

the external surface of the fascia. Or the suture ends, after traversing the bone, may be tied above the level of Poupart's ligament (Fig. 12), the knots lying between Poupart's ligament and the bone, or even between the periosteum and the bone, though the latter position is not free from objection on account of the risk of interfering unnecessarily with the vitality of the bone. The same choice of position, above or below Poupart's ligament, applies to the direction of the drill in making the perforations in the bone (which see). The factor in the choice of the position of both drill and ligature knots is the degree of relaxation which has occurred in Poupart's ligament.

The knots should in all cases be tied firmly to lodge the internal pillar against the bone. Here the amenity of the spermatic cord is efficiently protected, as is that of the femoral vein in the femcral operation, by adjusting the position and size of the loops of suture in the internal pillar, and not by varying the tension of the knots. Should threatened compression of cord (or vein) necessitate the "replacing" of the loops, time may be saved by dividing each loop above the bone and retaining the ends as tractors for the passage of the new sutures.

8. Complete the operation by lifting the lax Poupart's ligament to the anterior surface of the internal pillar, and fixing it there by interrupted sutures which should be of stout catgut, or other absorbable material, and should penetrate at least the external and internal oblique muscles. This final step in the operation is, obviously, one made possible solely by the lax condition of Poupart's ligament. It is difficult in small herniæ, impossible in the normal cadaver, and not easy to depict by pencil, however skilled (Fig. 11).

Modification of Operation.—As in femoral hernia, the method may be modified in cases where the operator finds himself unprovided with a drill. The anterior lip of the periosteal incision is a stout structure, comprising, in addition to the periosteum, the iliac fascia and the origin of the pectineus. This lip is to be slightly raised, and the ends of the suture

carried through it from within outward (Fig. 12) and tied there. The knot may lie above or below the level of Poupart's ligament (see remarks above). The operation is finished by suturing Poupart's ligament to the anterior surface of the internal pillar as described above (Fig. 11). The closure obtained by the modified operation is less secure than where bone suture is employed, but has been found efficient.

Remarks on the Foregoing Description of the Inguinal Operation.—It may be well to disarm criticism by repeating

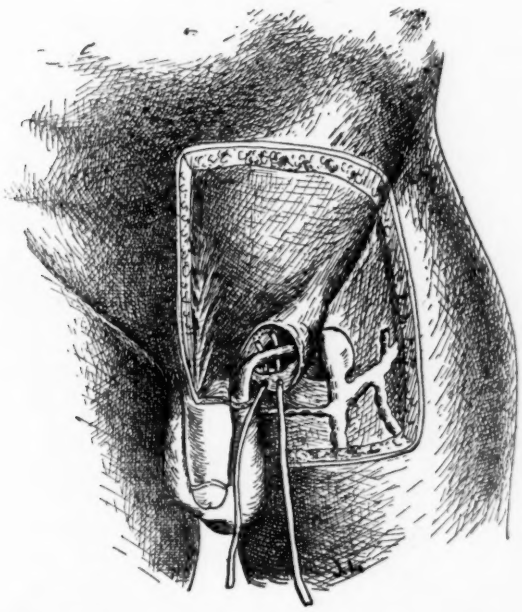

FIG. 12.—Modification of inguinal operation. Anterior lip of periosteal incision raised in the form of a short periosteofascial flap through which the sutures have been passed.

that this method of operating appears to have less *raison d'être* in inguinal than in femoral hernia, and has been employed for "severe" cases only. Further, it is to be noted that the method involves three distinct procedures in combination, and that the modification above described in the second procedure (the use of the anterior lip of the periosteal incision) comes near to trenching on known ground, while the third procedure (the suturing of Poupart's ligament to the internal pillar) is com-

mon to the majority of recognized operations for the radical cure of inguinal hernia.

To the skill and kindness of Dr. John Lindsay, of Glasgow, I am indebted for the sketches which form the illustrations.

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THE RADICAL OPERATION FOR INGUINAL HERNIA.

A METHOD FOR CLOSING ALL LAYERS WITH A SINGLE TIER OF EASILY REMOVABLE NON-BURIED SUTURES.

BY JOSEPH RILUS EASTMAN, M.D.,
OF INDIANAPOLIS, INDIANA.

In most cases of recurrence after radical operation for hernia it will be found that faulty asepsis is responsible for the accident. This is shown by the circumstance that since rubber gloves have come into general use the percentage of recurrence has been lowered in the experience of practically every surgeon who has made a considerable number of such operations. No matter what the method, if the sac be amputated high enough, hernia will not often recur provided the operative technique be aseptic. Very often the chain of asepsis is broken by the introduction of non-asepticizable absorbable sutures. An absorbable suture is never more than relatively aseptic, which means practically that it is not aseptic at all. On the other hand, the burying of non-absorbable sutures is attended with some danger, and few operators are willing to bury non-absorbable material in operating for inguinal hernia.

Upon the accompanying cut is represented a method for introducing a single tier of non-absorbable sutures which sutures coapt all the layers either according to Ferguson's so-called anatomic method or according to Bassini's. These sutures may be easily removed after firm union has taken place. So far as the possibility of its introduction is concerned, any sort of non-absorbable suture material may be used in this way. In eleven cases thus operated the writer has used heavy Pagenstecher celloidin linen. The manner of introduction of the sutures is simple. The time required for operating, all things being equal, is less than that required for the execution of the classical radical operations.

After incision down to the aponeurosis of the external oblique, exposing both rings, the overlying superficial tissues should be wiped with gauze from the aponeurotic layer to such an extent that Poupart's ligament may be freely exposed. After reduction of its contents, the sac should be twisted upon itself as practised by C. H. Mayo, so that all the slack of the peritoneum about the neck of the sac may be taken up before the transfixing suture is introduced.

The Pagenstecher linen suture bearing a needle upon each end is first passed through Poupart's ligament from without inward one inch from its free margin. It is then passed through the outer border of the obliquis internus and transversalis muscles and brought back through Poupart's ligament about one-third of an inch nearer the margin of this ligament than its first point of passage. The needle now external to and above Poupart's ligament is made to overlap the free margins of Poupart's ligament and the aponeurosis of the external oblique by carrying the linen through in the form of a simple running mattress suture. The needle is next passed through the superficial fascia, panniculus adiposus, and skin emerging about one-eighth of an inch from the skin wound margin upon the side opposite Poupart's ligament. The needle upon the tail end of the suture is brought up through the subcutaneous fat and skin upon the side of Poupart's ligament. When traction is made upon the two ends of the suture, no kinks or curls remain, and the suture is tied up as a simple loop and, being clipped, may be drawn out with the slightest traction.

In almost all cases it will be found easy to execute Ferguson's operation in this way; five or six sutures sufficing to coapt the layers anatomically from the internal ring to the pubic bone. Pursuant to Coley's suggestion relative to the Bassini operation, the writer has always introduced one of these sutures above the internal ring to reinforce this weak point.

In the radical operation for inguinal hernia in children, the method here described will be found applicable in practically every case, where, as Czerny has contended, the more

or less complicated classical methods of operating are quite unnecessary. In small herniæ of adults, the simple tier method is applicable. In very large herniæ with wide separation of the conjoined tendon and Poupart's ligament this suture will for obvious reasons not be efficient.

It should be understood that nothing whatever is claimed for the method except that all the layers may be readily and securely coapted in this manner in nearly all cases of hernia. As to the ultimate results, nothing is claimed, since the writer's operations have all been made within the year. There is, however, no apparent reason why the permanent results should not be good.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 25, 1905.

The President, HOWARD LILIENTHAL, M.D., in the Chair.

OPERATIVE TREATMENT OF CLEFT PALATE.

DR. CHARLES H. PECK read a paper with the above title (for which see page 5).

DR. H. LILIENTHAL presented a girl, eight years old, who at the age of three years was operated on by him for an enormous cleft involving both the hard and soft palates. The operation done was practically similar to that described by Dr. Peck, excepting that no tissue was cut away and that no obturator was used, as that device to assist in the protection and healing of the wound was at that time unknown to him.

The operation proved a complete failure, and it was decided not to resort to any further operative interference until the child was at least three years older. About that time he learned that by treating this condition with a skilfully made obturator the functional result was often better than could be obtained by surgery. He thereupon referred the patient to Dr. R. Ottolengui, of this city, who devised an obturator for her to wear. She was the youngest patient who had ever been fitted with such an appliance, and her condition at the time was very poor. She had a severe nasal catarrh, her voice was discordant and exceedingly disagreeable, and she was totally unable to make herself understood.

She had now worn the obturator about two years. Her general condition had greatly improved; her catarrh had disappeared, and while the result was still far from perfect, both her speech and the quality of her voice were vastly better. She was beginning to talk fairly well and was attending school.

Dr. Charles N. Dowd said that one of the interesting questions that arose in the discussion of this general subject was whether to operate upon very young children? Dr. Brophy, of Chicago, had operated on a large number of patients under six months of age, and his results were favorable. He used lead plates, which supported the palate on each side, and he omitted the lateral incision. Dr. Dowd said he had done this operation three or four times, and had found the plates of real service in the younger class of children. He did not think it was practicable, in those patients, to use an obturator.

Dr. Ellsworth Eliot, Jr., said that in every case of cleft palate where there was a reasonable hope of success, he thought an operation should be undertaken. Even if the operation proved unsuccessful, he understood that it did not interfere with the subsequent application of a mechanical appliance.

As regards the age at which operative interference should be recommended, the speaker thought it should not be done too early, when the parts were very small, nor too late, and before any marked defects of speech had been acquired. Personally, he preferred to operate at the age of four or five years. In the case of a young man of sixteen upon whom he had done Ferguson's operation, the soft palate was not only closed but there was also great improvement in articulation. He recalled other cases in adults where the operation had also given satisfactory results. In Brophy's operation, with which he had personally had no experience, the two superior maxillæ were forcibly approximated.

Dr. George Woolsey said that in the treatment of these cases he had tried both operation and the use of an obturator. The choice of the method largely rested with the child's parents. Many people did not like the idea of their children wearing an artificial appliance in the mouth. Another objection to that method was that it could not be satisfactorily employed until after the eruption of the six-year molars, which is often delayed. Personally, he was in favor of operating in almost every case where there was a fair chance of approximating the edges of the cleft. In cases with a very wide cleft, Dr. Ochsner, of Chicago, had recommended an apparently feasible method of chiselling up between the alveolar processes and the bony palate, and then plugging this gap after forcing the bony palate inward towards the cleft. Dr. Woolsey said that in the single case where he had

resorted to this method he was unable to state the final outcome of the operation, as the patient had been lost sight of. The Brophy operation, in infancy, could only be done when the bony parts were so pliable that the lateral halves of the maxillæ could be forcibly approximated,—*i.e.,* in the first three months of infancy. He had only operated on one such case.

Dr. Dowd said that Brophy had described two distinct operations; one, in dealing with cases of complete cleft palate through the alveolar process, in which he brought the two sections forcibly together, while in the other, where the cleft was not complete, he utilized the lead plates. Dr. Dowd said that about a year ago he showed the result of an operation in a child of three months where the parts came together pretty well. In that case the cleft had gone entirely through the alveolar portion of the jaw. Since that time, at a second operation, he had brought the parts still further together, so that the result was very good. In that instance it was necessary to use considerable force, and also to make an incision in the jaw above the alveolar process so as to further free the parts.

Dr. Peck said he had been unable to determine from Brophy's writings whether or not he attempted to secure complete closure of the soft and hard palates at a single sitting. The important feature in these operations was to secure closure of the soft palate as early as possible, so that the parts might develop with the growth of the child.

As regarded the mortality of the operation, Dr. Peck said, an English surgeon had collected eleven cases, with five deaths, Brophy had reported over three hundred cases, with a death rate of three per cent. He had also reported over nine hundred operations upon the palate, but the exact extent of the lesion was not given nor the immediate nor ultimate result. He had not seen nor heard of any case operated upon in this city where the Brophy operation had resulted in a complete closure.

Dr. Dowd said he thought that in the Brophy operation for incomplete cleft, immediate closure of both the hard and soft palates was aimed at. In the other operation, when the cleft extended through the alveolar process and the bones had to be forcibly brought together, complete closure usually was not attempted at one sitting. However, it could be done at a subsequent operation. One feature that should not be lost sight of

in these operations was the possible shortening of the short palate, and in order to prevent that, it was of great importance to secure closure of the hard palate, so as to obviate traction. In 1901 Brophy had reported over two hundred operations in infants under six months of age without any mortality. He had a mortality in those over that age.

DR. LILIENTHAL said that, in choosing between operation and prosthesis, the determining factor should be the question of mortality. A mechanical appliance, as had been demonstrated in the case shown, gave a pretty good functional result—as good, if not better than any he had seen accomplished by pure surgery. He recalled a case of congenital cleft palate where the effect of the application of an obturator by Dr. Ottolengui was such that no defect was perceptible in the patient's speech. It was so perfect, in fact, that he passed the surgeon's examination during the war with Spain, and his disability was not discovered until he contracted typhoid fever.

In a case of congenital cleft palate where the child was unable to be fed, Dr. Lilienthal thought that Brophy's operation should be promptly tried, and, if possible, done before the infant was ten days old. In those cases something had to be done without delay. In cases where the operation was not urgent, lives would undoubtedly be saved by not operating. There was a distinct mortality connected with the operation, and in the speaker's experience, a pretty high one, probably not less than ten per cent. This question of mortality should be squarely put before the parents.

As to the operation itself, the speaker said the operator would do well to take advantage of the suggestion made by the elder Warren and dip his silk sutures into the compound tincture of benzoin, which would make the knotting easier.

DR. R. OTTOLENGUI said he did not agree with the statement made by Dr. Eliot that, even if an operation proved unsuccessful in these cases, it did not interfere with the subsequent application of a mechanical appliance. When these patients are allowed to remain as they were originally, they present certain conditions which have been studied and can be remedied, but after they have been subjected to a surgical operation which proves a failure, they present unique conditions, each of which necessitates special study and a special apparatus.

Such cases are much more difficult to treat by means of an obturator than if they had been left alone.

The speaker said he was well acquainted with the work of Dr. Brophy, and he knew of one instance where that operator had secured a fine result in articulation, and that was in an infant. It took some eight or ten years to discover whether these operations were successful or not, on account of the possibility that the palate would fail to lengthen along the cicatricial line. For that reason he thought that, if an operation was decided on, it had better be postponed until adult life, so that the growth of the palate would not be interfered with. He had never yet seen a case operated on in early life where the growth of the soft palate had not been interfered with. In dealing with a cleft of the hard palate this objection was of less importance, as there was more tissue to be utilized.

He laid special stress upon a case of a girl operated on, by his advice, at the age of four. The operation proved quite as successful as those shown at this time, and with instruction the girl learned to talk well. At the age of twelve, however, the growth of the palate, everywhere except along the cicatrix, practically produced a cleft palate, and an obturator became needful.

In one instance of cleft palate in a girl, he had fitted her with an obturator when she was eleven years old. She had since married, and her husband had never discovered the fact that she had a cleft palate.

He had seen complete immediate closure of the hard and soft palate in an operation done by Dr. Brophy. When one succeeded in closing the hard palate, the remainder of the operation could be done subsequently, or it could be done at a single sitting. That depended on the condition of the patient and the wish of the operator.

Dr. Peck said he thought that closure of the hard palate was most easily accomplished by the flap operation, although he had never attempted this method in young children, and he believed that it would be increasingly dangerous in patients under two or two and a half years old. Personally, he preferred to do the operation on children after they had reached the age of six or seven years.

In regard to the final improvement in speech he was unable to make any definite statements, as all of his cases were compara-

tively recent. In some of them, however, there had been a remarkable improvement in the speech. He had operated on eight cases during the past eighteen months, two of the patients being adults, aged, respectively, nineteen and twenty-one years. In the first of these two, there was complete healing, with the exception of one small area, which broke down and healed by granulation in a few weeks. In the other case there was a complete cleft extending forward through the alveolar process, and complete closure was not attempted at the primary operation, the anterior end being left for a future sitting. In that instance complete closure of the sutured part was obtained, but the patient had failed to return for the secondary operation. In both of these cases the improvement in speech had been slight when they were last seen. As a suture material in all of his cases, Dr. Peck said he had used plain silk. An important point in the technique was to secure accurate apposition of the parts. In the after-treatment he had commenced feeding early and had never resorted to rectal alimentation. He had had no mortality, nor had he seen any alarming symptoms follow the operation. He believed it was possible to get complete healing of both the hard and soft palates in almost every case. In perhaps 50 per cent. of the cases a slight secondary operation might become necessary.

CONGENITAL PYLORIC STENOSIS.

Dr. John Rogers presented an infant, born on April 1, 1905. It weighed ten pounds at birth, and it was noted at the time that it had a right inguinal hernia. The infant was breast-fed from the outset, but "spat-up" a good deal of the milk. On May 25, it first began to vomit constantly soon after every nursing, and this continued and grew worse in spite of lavage, the use of various kinds of artificial foods, etc. By the 28th of June the child had become extremely emaciated, and a visible peristaltic wave of the stomach was noticed for the first time. There was no tumor: constipation was quite marked: only a slight discoloration was obtained in the water after an enema; the vomiting was not of an expulsive character. It was also observed at this time that after one or two attacks of vomiting, the stomach would, on washing, be found to contain, almost intact, the food taken six hours previously. Once the mother noticed that the vomitus was much more than the last feeding.

The diagnosis of congenital pyloric stenosis was made, and the child was operated on June 30. At that time it was three months old, and weighed seven and one-half pounds. The abdomen was opened through a median incision and a simple posterior gastro-enterostomy done by suture according to the Czerny-Peterson method, without any loop. The original intention had been to effect the anastomosis by means of a Murphy button, and Dr. Willy Meyer had loaned him an extremely small button (about one-half the size of the smallest normal Murphy button), which had been especially constructed with such a case in view, but even this small-sized button was found to be entirely too large, and the parts were sutured. The pylorus was found to be about the size of the end of an adult thumb, very hard, and lying well up under the liver, so that it would have been impossible to palpate it. Dilatation would have been impossible, as would also, probably, pyloroplasty.

On the day after the operation, the patient's temperature rose to 103° F.; pulse,160, and the vomiting still continued. On the following day these symptoms had disappeared, and from that time on the child made an uneventful recovery and had gained rapidly in weight and strength.

Dr. Willy Meyer said that about five years ago he was called upon to operate on two cases of congenital pyloric stenosis. The first was that of an eight weeks baby, very much emaciated. A posterior gastro-enterostomy was done with the smallest-sized Murphy button then in the market (cholecystenterostomy), which fitted very closely. The patient did very well for the first two days; then vomiting recurred and the child died. At the autopsy, a mechanical obstruction of the small intestine, due to the button, was found.

In his second case, which was operated on about six weeks later, he employed the suture instead of the button. That case also resulted fatally. In any future case of this kind upon which he might be called upon to operate, Dr. Meyer said he would always resort to suture in preference to the button, and would insist on having the patient removed to the hospital. Both of his operations were done at the patients' homes. For cases of emergency he now possessed "baby buttons," with a diameter of four-eighths and five-eighths of an inch. They are manufactured by Tiemann & Co. The case of the first child thus

operated on was published by Dr. S. F. Meltzer in the *Medical Review*. The specimen is in the Pathological Museum of the College of Physicians and Surgeons.

ACUTE PANCREATITIS; CHOLELITHIASIS.

Dr. Howard Lilienthal presented a woman, twenty-two years old, who three weeks before her admission to The Mount Sinai Hospital, and six weeks after the birth of her first child, had an attack of epigastric pain and vomiting, which subsided in a few hours. Since then she had felt well until the day prior to her admission, when she was seized with a sharp, lancinating pain in the right hypochondrium, radiating downward. She had vomited twice, once bile-stained. The bowels were normal; there was no jaundice. Subsequently the pain radiated over the entire abdomen, but was most marked in the epigastric and right hypochondriac regions.

On admission, May 26, 1905, the abdomen was markedly distended and rigid, so that deep palpation was impossible. There was marked tenderness in the epigastrium, as well as in both iliac fossæ. Vaginal and rectal examinations were negative. Under anæsthesia a mass was palpable in the epigastrium. The patient's temperature was 101.8°; pulse, 120; respiration, 28. The impression made was that of an individual suffering from perforation of one of the viscera, with peritonitis. The easily palpable epigastric mass led to the belief that the case was one of perforated gastric ulcer with considerable effused lymph, and probably adhesions with neighboring viscera.

Operation.—May 28. When the peritoneum was opened through a median incision above the umbilicus, bloody fluid escaped. The fat of the omentum and parietal peritoneum showed many areas of necrosis, and, to a lesser extent, the subcutaneous fat. The pancreas was enlarged and hard, especially the head. After closing the median wound an incision was made through the right rectus in order to reach the gall-bladder. Aspiration of the pancreas through this opening was negative. The peritoneum of the gall-bladder was sewn to the parietal peritoneum, and a purse-string suture passed about the fundus of the gall-bladder. On incision, much bile-stained mucus escaped, and many small granular stones, as well as two larger (pea-sized)

ones. A tube was inserted into the gall-bladder for drainage, and gauze packed about the visceral opening.

The post-operative progress of the patient was uneventful. There were occasional complaints of sharp pains in the abdomen, and the temperature during the first week ranged between 100° and 102° F.; the pulse, between 85 and 110. There was a copious discharge of bile for the first two weeks. The patient was discharged cured on June 27, with a small superficial sinus.

Microscopical examination of the omental fat removed at the time of operation showed fat necrosis. The material draining from the gall-bladder was examined by the physiological chemist of the hospital, for trypsin, steapsin and pancreatic rennet, with negative results. Examination of the stools was negative for blood; positive for bile and free fat.

When this patient was examined on October 22, 1905. she appeared to be in normal health. The abdomen was somewhat distended by gas in the intestines, but there were no symptoms of disturbed digestion. The cicatrix was small and firm.

Dr. John F. Erdman said he had recently operated on two cases of acute hæmorrhagic pancreatitis. The first, on the tenth day of disease, which resulted fatally, was not recognized until the autopsy, when two very small calculi were found in the pancreatic duct. They were soft, and apparently gall-stones. At the time of the operation, two hundred and twenty stones had been removed from the gall-bladder. The second operation was done eleven hours after the onset of the pain, two weeks ago, and the patient was apparently on the road to recovery.

Dr. Lilienthal, in speaking of cholecystotomy in dealing with acute pancreatitis, said that unless the pancreatic fluid was found there upon examination, he did not see how the mere drainage of the gall-bladder did any special good, excepting possibly in those rare cases where immediate relief was afforded by removing a stone from the common duct. He thought it was the puncture of the pancreas that proved beneficial in those cases, and not the cholecystotomy.

Dr. Woolsey said that he did not think it necessary to puncture the pancreas. He had had three cases that recovered without puncturing the pancreas, limiting himself to opening and washing out the peritoneal cavity. In all of them there was profound collapse. He had expected to do a secondary

operation, but it proved unnecessary. He had not touched the gall-bladder as the time required could not be given owing to the collapsed condition of the patients.

DR. LILIENTHAL said that in two out of three cases upon which he had operated he did not wash out out the peritoneal cavity, and both cases got well.

END TO END ANASTOMOSIS FOR CARCINOMA OF THE SPLENIC FLEXURE.

DR. LILIENTHAL presented a woman twenty-two years old, who, when she came under his observation, early last June, complained of vague pains in the left hypochondriac region, and palpation in that region revealed a fairly hard mass, about the size of an adult fist. The patient gave no intestinal symptoms. The urine was negative, and blood examinations failed to give any clue as to the nature of the trouble. She stated that at the onset of her trouble, she had had occasionally attacks of abdominal cramps. Her general health had deteriorated considerably. The tumor felt like a large movable kidney.

An exploratory operation was decided on, and the left kidney was exposed, and proved to be normal in size and position. The growth that had been felt proved to be a carcinoma of the splenic flexure of the colon. There were a number of firm adhesions to the stomach which had to be removed by ligation. The involved section of the gut was then removed, and an end-to-end anastomosis effected by suture.

There was slight intestinal leakage for a few days after the operation, but this was at no time alarming. The result of the operation was very satisfactory, and the patient is now enjoying excellent health, and has gained considerably in weight.

DR. LILIENTHAL said the incision he had employed in this operation was the one commonly resorted to in exploring the kidney, and while it was unusual in a case of this kind, it gave excellent access to the tumor, and the subsequent drainage was perfect. In this connection, he stated that Dr. Moschowitz had just called his attention to a reference by Alfred Neumann in a recent number of *Langenbeck's Archives* giving the report of a case of resection of the colon through the usual incision made for exposure of the kidney.

A microscopical examination of the growth in this case, Dr.

Lilienthal said, was made by Dr. Libman and proved it to be an adeno-carcinoma.

RESECTION OF RECTUM FOR SYPHILITIC STRICTURE, WITH END TO END ANASTOMOSIS.

Dr. John A. Hartwell presented a negress, thirty-eight years old, who was admitted to the Lincoln Hospital about the middle of March, 1905. She gave no past history of syphilis. Five years before she had been operated on at a New York hospital for a fistula-in-ano which had never healed up. Examination showed a tumor of the rectum, situated about two and a half inches from the margin of the anus. It was hard and firm, and could be distinctly felt through the vagina. The tumor surrounded the gut, the calibre of which was just large enough to admit the tip of the finger, and the upper margin could not be felt. Upon examination it proved to be a simple chronic inflammation, without any evidence of new growth. A diagnosis of syphilitic stricture of the rectum was made, and the patient was advised to submit to a colostomy, but she refused.

On March 28, 1905, with the patient in an exaggerated knee-chest position, a median incision was made from the fifth sacral vertebra down over the coccyx to the anus. The anal opening was then closed with a purse-string suture, and the rectum entirely freed from its bed for a distance of about six or seven inches from a point two inches above the anus. Two clamps were then applied above the tumor and the section made between them with the actual cautery. After dissecting out the mass, the gut was divided between clamps just below the tumor and the distal end of the upper segment of the gut was brought out through the anus, and sutured to the skin. The sphincters were not incised.

About five days after the operation, sloughing of the tissues along the line of suture occurred, resulting in an open space of about one inch between the upper and the lower segments of the gut. A vaginal sinus occurred, and the bowels moved both into the vagina and into the posterior opening. The vaginal sinus closed within two months, and in June, 1905, about three months after the operation, the patient had a normal passage that would admit the largest bougie without any difficulty. She

then went into the country and neglected to keep the passage dilated, and three weeks ago, when she was admitted to Bellevue Hospital, a stricture had re-formed which was so tight that it would scarcely admit the index finger. This was dilated under anæsthesia, and the patient now had a fairly normal passage.

Dr. F. Kammerer said that his experience with resection of the rectum for stricture had not been very encouraging although no deaths had followed operative interference. In a number of such operations that he had done the stricture had recurred. The operation itself is generally a much more difficult procedure than a resection for carcinoma, owing to the extended cicatricial contraction in the perirectal spaces. Of course, in these cases, as well as in operation for cancer, an artificial anus should always be established. There can be no question that one does occasionally get complete union of the resected ends of the bowel without preliminary colostomy, but these instances in the speaker's experience, are rare, as the sutures generally give way at the posterior circumference, resulting in a sacral fecal fistula above the anus, which is very difficult to close. For cancer of the rectum resections had the further disadvantage of forming recurrences. The speaker said he was well aware that cancer of the rectum, under equal conditions, was less likely to recur after removal than cancer of other organs, but it had been his experience that, when it did recur, it was generally in the line of suture after a resection. The speaker, therefore, believed that resection of the rectum would be viewed in a less favorable light than it had been by surgeons some eight or ten years ago.

Dr. Willy Meyer said that Kraske had recently reported quite a series of cases where the result of resection of the rectum for cancer had been most excellent, and he had again highly recommended the operation.

Dr. Hartwell, in closing, said he agreed entirely with Dr. Kammerer, and in a paper which he had read before the Society last spring, he had made the statement that a colostomy should always be done before attempting a resection for either stricture or carcinoma. In the case he had just reported the patient had absolutely refused a colostomy. He was not hopeful that the stricture would not recur as extensively as before the operation though at the present time it was of soft tissue and could be easily dilated.

RESECTION OF THE COLON.

DR. OTTO G. T. KILIANI presented a specimen removed from a woman, twenty-five years old, who was admitted to the German Hospital on June 12, 1905. She stated that six weeks before admission she had begun to suffer from discomfort and colicky pains in the epigastric and right hypochondriac regions, and that at certain times a tumor appeared and disappeared in the middle of the abdomen. This tumor was hard, but not tender. She also complained of vomiting after meals, loss of appetite and weight, and chronic constipation. For five weeks she had been an inmate of another hospital, where she was treated for a possible ulcer of the stomach.

When Dr. Kiliani examined her, there was slight resistance in the epigastric region, which he thought was possibly due to a carcinoma of the colon. Upon opening the abdomen, he found a tumor, which proved to be a carcinoma of the colon, and in order to remove it twelve centimeters of the gut were resected.

The patient has gone back to Switzerland and is, according to a letter received two weeks ago, entirely well so far.

RESECTION OF INTESTINE FOLLOWED BY END-TO-END ANASTOMOSIS.

DR. ELLSWORTH ELIOT, JR., read a paper with the above title (for which see page 92).

DR. CHARLES N. DOWD said that the particular section of the intestine that was to be resected was a matter of much importance. In the region of the colon it became necessary, at times, to deal with a very troublesome condition, namely, the peritoneum, instead of lying close to the intestinal wall is separated from it by a thick deposit of fat. Even in the sigmoid flexure, where there is a distinct meso colon, the peritoneum may only be in contact with the muscular layer through one quarter of the circumference, a layer of fat one-half inch or even an inch in thickness separating it elsewhere. It is very difficult to obtain good union in this part; hence, if the end-to-end method is used, it is wise to insert enough gauze to provide for possible leakage. He had recently operated on three cases of sigmoid carcinoma in two of which he had used the end-to-end method—in the third a lateral anastomosis.

Dr. Willy Meyer said that in the early diagnosis of cancer of the large intestine the history given by the patient was very important. One symptom that could often be elicited early, was a peculiar sensation within the abdomen, a stiffening or feeling of contraction, as though from an effort to overcome an obstruction. Gurgling was another symptom, often made out by auscultation. Actual palpation of the tumor was certainly very difficult in many instances. If successful, operation frequently was too late. A satisfactory examination could only be made under a general anæsthetic, which ought to be more frequently resorted to in suspicious cases. If the symptoms were pointing to a malignant growth, and if the patient was steadily losing in weight and health, an exploratory incision should be insisted on.

Dr. George Woolsey recalled two cases of carcinoma of the splenic flexure which came to him after obstruction had occurred. No previous symptoms could be elicited, and the only history obtainable was that one admitted that after he had drunk too much he had had stomach-ache which was relieved by a hot mustard foot-bath.

Dr. Hartwell said that at the recent meeting of the New York State Medical Association, Dr. James P. Tuttle had read a paper upon carcinoma of the intestinal tract, in which he had referred to the great frequency of the disease, especially in the large intestine, and he had quoted statistics to show that if the present increase went on, carcinoma would eventually cause more deaths than tuberculosis. The general profession had thus far failed to appreciate the importance of an early diagnosis in cancer of the lower gut, and the omission of an ordinary rectal examination was the rule rather than the exception. Only three weeks ago, Dr. Hartwell said, he saw a patient with a carcinoma of the upper part of the rectum, just above the reach of the finger, although it could be plainly seen with the proctoscope. That patient had been under treatment by a number of physicians for eighteen months, and had been sent to Colorado for supposed tuberculosis.

Dr. Eliot, in closing, said he would hesitate to introduce a large drain in these cases in order to prevent leakage, as he would be afraid that its withdrawal might tear open the suture line. He preferred a small intra-peritoneal gauze drain reinforced by the introduction of a rubber tube by an assistant to a point within the rectum beyond the suture line.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 2, 1905.

The President, HENRY R. WHARTON, M.D., in the Chair.

STAB WOUND OF THE LUNG.—TREATED BY SUTURE.

DR. JOHN H. JOPSON presented a young man, who, six weeks before, had been stabbed in the fifth interspace in the anterior axillary line of the left side. When the man was seen there was, in addition to signs of a developing pneumothorax, external hemorrhage, severe enough to make its active control desirable. The wound was enlarged, a part of the sixth rib resected, and inspection made of the pericardium and diaphragm, both of which proved to be uninjured. Examination of the collapsed lung revealed a cut, one and one-half inches long, as the active site of the hemorrhage. The lung was grasped by forceps, drawn out, and the hemorrhage controlled by a continuous catgut suture. The pleura was drained by means of a tube and gauze inserted in the original wound and also posteriorly in an opening made for that purpose. Pyocyaneous infection occurred and later pneumonia developed but the patient recovered. Now, at the end of six weeks, there remains a discharging sinus leading to a contracting cavity of moderate size.

In another case seen recently, there were five wounds in the back, one penetrating the pleura. In that instance Dr. Jopson did not resect a rib but simply plugged the wound with gauze. Symptoms similar to those in the present case developed. After two days the gauze was removed to allow the blood to escape. The wound was then replugged for two days when the drainage tube was inserted. The patient was recovering. Dr. Jopson is aware there is a great difference of opinion as to the control of hemorrhage and also regarding other points in the management of these

wounds; in the case shown, the control of hemorrhage seemed to be the imperative indication.

Dr. Robert G. Le Conte said that several years ago he had discussed before the Society the subject of penetrating wounds of the lung, and that he had had no reason since to change the opinions then expressed. His conclusions at that time were that when a wound of the lung is causing only slight hemorrhage, the external wound should be closed with gauze and the physical signs of bleeding watched for. When the hemorrhage is more marked, a small drainage tube should be inserted into the pleura and the admission of air regulated according to the difficulty of respiration in the patient. When the hemorrhage is large and the symptoms alarming, open the chest and insert a large drainage tube, so as to form a rapid and complete pneumothorax; at the same time, when necessary, give salt solution intravenously, When this fails to control the hemorrhage, as shown by the increasing failure of the pulse, it becomes necessary to resect one or more ribs and deal radically with the bleeding vessel, either by ligation, suture, or packing. In severe hemorrhage from the lung the first object is to get pressure on that lung, and this is best accomplished by opening the chest and forming a pneumothorax. The admission of air to the pleura is under perfect control, and it can be increased, diminished or stopped at will, should untoward symptoms appear. Besides permitting a collapse of the injured lung and bringing direct pressure upon it, the presence of air favors the formation of a clot in the severed vessel. This procedure in his experience has been sufficient to control a very alarming hemorrhage from the lung, and he had not yet had a case where resection of a rib was necessary, with suture of the lung.

GASTROENTEROSTOMY FOR GASTRIC ULCER.

Dr. Francis T. Stewart reported the following case to call attention again to the difficulty sometimes encountered in differentiating between carcinoma and extensive perigastritis the result of chronic ulcer of the stomach, and to emphasize the advisability of exploratory laparotomy in cases in which intra-abdominal malignant disease is believed to be present. In the upper abdomen a palpable carcinoma so often means the time for cure has passed, that some physicians counsel soothing medical treatment rather than surgical interference unless there are indications for some

palliative procedure. One can rarely be absolutely sure, however, that the condition is malignant, and right is on the side of the surgeon who explores such cases with the belief that he is dealing with an inoperable cancer, but with the hope that he will find gastric ulcer, or gall-stones, or chronic pancreatitis, or some other condition equally amenable to treatment, or, that in the event of malignancy, he will find the disease removable or at least so situated as to permit of some measure which will relieve the patient's suffering. His own patient, a man aged forty-two years, was admitted to the Polyclinic Hospital in September, 1904. He had suffered with indigestion for eight years, during which time, at irregular intervals, he would have attacks of vomiting which would relieve the almost constant pain he experienced in the epigastrium. Two years ago his appendix was removed by another surgeon without giving the hoped-for comfort. Three or four days before admission he had vomited a mouthful of blood, and this was the only time as far as he could remember. During the last year he has lost 77 pounds in weight. At the time of examination he was lemon-colored, markedly emaciated, vomiting all food, and suffering constant pain in the upper part of the abdomen. Beneath the upper part of the right rectus lay an immovable tender mass about the size of an adult fist. The stomach contents showed HCl .073 per cent., total acidity 51, and the presence of lactic acid. The stomach was not distended owing to the discomfort produced. Blood examination revealed hemoglobin 45 per cent., leukocytes 5,000 and red cells 3,000,000. Operation was performed September 30, 1904, disclosing a hard tumor involving the pylorus and adherent to and apparently infiltrating the pancreas, liver, colon and anterior abdominal wall. The adjacent lymphatic glands were swollen and indurated. With some difficulty a posterior gastroenterostomy without the loop and without the button, was performed. For six days following the operation the patient vomited large quantities of dark fluid which during one twenty-four hours amounted to 172 ounces. He refused a second operation and was thought at one time to be dying. The vomiting ceased rather suddenly but recurred at intervals for four weeks and then stopped permanently. The patient is now absolutely well, eats all sorts of food without any distress, has gained 62 pounds in weight, and no tumor can be detected on careful palpation of the abdomen.

DR. JOHN H. GIBBON recalled an exactly similar case upon which he operated two years ago. The mass involved the pylorus and was as large as a fist. He performed gastroenterostomy with the idea of later doing a pylorectomy or partial gastrectomy, but as in Dr. Stewart's case the patient went on to perfect recovery and is now perfectly well. Both these cases show the advisability of operating even in the presence of a large mass.

RECOVERY AFTER EXTENSIVE FRACTURE OF SKULL.

DR. WILLIAM L. RODMAN showed a patient upon whom he had operated two weeks previously for an extensive fracture of the skull. The man was struck with a beer bottle thrown with great force which mashed in the right side of the frontal region. When seen he was conscious, with a pulse of 62 and respirations 20. The fracture involved both the vault and the base of the skull and extended into each frontal sinus. Large fragments of the skull were removed and as the jagged bone had torn the meninges, they were further incised and the brain inspected and irrigated. A large blood clot was found but this had caused only slight paresis of the right arm. The frontal sinuses were packed to prevent infection. The patient unexpectedly made a prompt and uneventful recovery.

A TRANSVERSE INCISION FOR THE REMOVAL OF THE APPENDIX.

DR. GWILYM G. DAVIS read a paper on this subject (for which see page 106).

DR. WILLIAM L. RODMAN agreed that McBurney's operation is anatomically correct and usually satisfactory in clean cases; in pus cases it is inadequate and should not be employed. It would seem that any transverse incision is more liable than oblique ones to be followed by ventral hernia though Dr. Davis has not found this to be the case in the operation he advocated.

RADICAL CURE OF DIRECT INGUINAL HERNIA.

DR. GWILYM G. DAVIS read a paper with this title (for which see page 111).

DR. WM. L. RODMAN was much interested in Dr. Davis's statements regarding direct inguinal hernia. He believes the

frequency of this type is greatly over-rated by anatomists; instead of being in the ratio of 1 to 5 as usually stated, he considers 1 to 25 more nearly correct. In more than 300 operations for hernia he has rarely seen the direct form, though recently he operated upon two cases in one day, one of them being a hernia of the bladder, the only one he has ever seen. He has never encountered the conjoined tendon as a covering of a hernia and does not see why it should be so, it being very easy for the gut to slip around the muscle and, going in the direction of least resistance, carry with it the transversalis fascia instead; the former condition may occur in persons with great muscular relaxation but does not take place usually. Dr. Rodman made this point in a lecture several years ago when Dr. Coley was present and this experienced operator agreed that the conjoined tendon was rarely, if ever, present as a hernial covering. Dr. Rodman finds the transplantation of the sheath of the rectus, after Halsted's method, very satisfactory and is resorting to it with increasing frequency and confidence in cases of relaxed musculature. He does not operate on direct hernia with the same confidence that he feels regarding the indirect form but considers Halsted's method of transplanting the anterior sheath of the rectus and also using the cremaster muscle as distinctly strengthening the wall. Operated upon in this way, direct inguinal hernias will seldom recur. He has had but one recurrence of a direct hernia in the comparatively small number he has operated and this was reoperated by Halsted's method *four* years ago and remains perfectly cured. The patient is a motorman, leads a very active life, and has given the cicatrix sufficient test. Recurrence, in any hernia, is rare after one year.

Dr Davis, in closing, said the experience of various surgeons differed greatly as to the proportion of direct to indirect hernias. The number of the former is not large but, though he does not see many of them, he operated upon five hernias in four patients within a short time during the past winter. As to the occurrence of hernia in the transverse incision for appendicitis, in the case of the short incision, the inner half, three-fourths inch, is blocked by the rectus muscle and the outer half by the transversalis and external oblique. When the larger incision is employed, the inner two inches is blocked by the rectus and the outer three inches by the internal oblique and the transversalis which are cut in the direction of their fibers. The only aponeurosis divided diago-

nally to its fibers is that of the external oblique and it seems to heal strongly and satisfactorily.

APPENDICEAL ABSCESS POINTING IN THE RIGHT SIDE OF THE SCROTUM IN A PATIENT FREE FROM HERNIA.

Dr. Robert G. Le Conte reported the case of a man, aged twenty-one, colored, who was admitted to the Pennsylvania Hospital on the morning of July 17, 1905, with the following history: Seven days previous to admission he was seized with pain in the abdomen and vomiting. Fever developed soon afterwards, and the abdominal pain continued, with rigidity and tenderness over the appendix. The night before admission the pain suddenly extended to the right scrotum, with the appearance of a tumor in this region.

On admission the temperature was 102°; pulse 104; respirations rapid; facial expression pinched; mucous membranes blanched. The abdomen was slightly distended and tympanitic, with marked rigidity on the right side and exquisite tenderness over the whole lower right quadrant, where a diffuse mass could be made out, the feeling of tumor extending down to the right inguinal ring. The external inguinal ring and upper portion of the scrotum were filled with a tumor the size of an orange, the overlying skin being reddened and edematous. This swelling was tense, dull, without fluctuation or impulse on coughing, and did not diminish with taxis. No history could be elicited of a previous hernia, and as the man had been in bed for a week the probability that this mass might be inflamed omentum was remote. There was no obstruction of the bowels, they having been freely moved the night previous. It was therefore thought that a patent funicular process had existed since birth, into which an appendiceal abscess had ruptured.

Ethyl chlorid and ether were used for narcosis, and a three-inch incision was made over the scrotal mass, extending from the external ring downwards. As the dissection proceeded a thick, inflammatory capsule was opened and a large quantity of pus evacuated with a typical appendiceal odor. The finger readily passed through the inguinal canal into the abdomen, but only a rounded channel could be felt and no portion of the appendix was within reach. Owing to the precarious condition of the patient further operative procedure was not considered. A drainage tube

was inserted through the internal abdominal ring into the abdomen, and a portion of the wound closed with silkworm gut sutures.

The following day the patient's condition was still very serious; pulse rapid and weak; temperature 102.4; discharge on the dressings was very free. He responded fairly well to free stimulation. The day following his condition had somewhat improved. From then on convalescence was fairly rapid, although the temperature remained elevated for a week. The wound gradually closed, until only a small sinus resulted, with persistent discharge.

On August 23 the patient consented to a second operation for the removal of the appendix. This was done by Dr. Hutchinson.

Ethyl chlorid and ether narcosis. Incision was made along outer border of right rectus below umbilicus, and was gradually prolonged until the internal abdominal ring was exposed. On opening the abdomen the intestines were found matted together, and after some difficulty the cecum was recognized and in part isolated. What appeared to be the stump of a sloughed-off appendix was caught and ligated, but later, after breaking up still more of the adhesions in an attempt to trace the sinus to the scrotum, the real stump of the appendix was found in a retrocecal position. It was patulous and oozing a small amount of fecal material. The stump was tied, inverted with a pursestring suture of chromicised gut, followed by a few Lembert interrupted sutures. The tip of the appendix, which had sloughed off, was found still further posterior to the head of the cecum in an opening through the pelvic peritoneum, the cavity resembling somewhat the sac of a hernia. On removing it a fecal concretion about as large as a bean was also found in this pouch. A probe entered in the scrotal sinus passed directly into this pouch, the sinus being entirely posterior to the pelvic peritoneum, and in that sense extra-peritoneal. The sinus was curetted and the sub-cecal region drained with iodoform gauze. The wound was partly closed.

An uninterrupted recovery followed this operation, and by the 10th of September the wound and sinus had entirely closed, and on the 13th the patient was discharged cured.

An interesting and unexpected feature in this case was the perforation of the pelvic peritoneum with the burrowing of the

abscess outside of the peritoneal cavity, the pus finding its way into a previously normal inguinal canal and scrotum. In this case there was no history of a hernia, nor did the operation show that one had previously existed. It seems strange that the pus after having broken through the pelvic peritoneum and reached the psoas muscle—did not follow this muscle and point in the usual position for psoas abscess, instead of entering a normal inguinal canal.

Dr. James P. Hutchinson said the most interesting point to him regarding the case was his mistake of opening too low down for the appendix, though this part was relatively free from adhesions as compared with the upper part. The appendix was difficult to bring up and he believes he tore the organ from its cecal attachment during the attempt at removal. When the other portion was removed it was patulous; hence the belief that the concretion came from the appendix and not from the cecum.

STONE IN THE CYSTIC DUCT.

Dr. Charles F. Mitchell presented a specimen obtained from a patient whose gall-bladder contained seventy-five gall-stones and a quantity of pus. The cystic duct was dilated as was also the hepatic duct, the latter readily admitting a finger. A number of stones were removed from the hepatic duct. Following operation the patient developed many complications and finally died. At autopsy the cystic duct was found to be almost occluded by a faceted stone which was probably left in the hepatic duct at the time of operation.

Dr. John H. Gibbon found the patient referred to by Dr. Mitchell in his ward when he went on duty; the gall-bladder wound was still draining but in a few weeks it entirely closed and there were no symptoms referable to the liver. A rectovaginal fistula which had developed shortly after the gall-bladder operation was the important feature at this time. Dr. Harte regarded it as the result of numerous turpentine enemas; at one time a spoon had also been used in removing hardened feces. Pure pus was discharged from the fistula about one week after Dr. Gibbon took charge and in a few weeks this was repeated. At these times there was a chill and rise of temperature and the patient developed a low sepsis. Dr. Gibbon concluded there was an abscess cavity in the abdomen, originating in the appendix or a

tube, and emptying into the bowel. As Dr. Mitchell found the appendix normal when he operated, that organ seemed to be excluded. Because of the infiltration about the fistula a satisfactory examination of the tubes could not be made. Exploratory operation was possibly too long deferred but the abdomen was finally opened. The peritoneal cavity was full of light, straw-colored fluid. The tubes and ovaries were slightly adherent to the surrounding structures but no abscess was found. The rectum was adherent to the uterus and attempt to separate them resulted in the finger passing into the rectum. In closing the fistula, two other small openings into the vagina were found; the rectum was an unrecognizable cavity containing a quantity of pus. The patient was practically pulseless when operated upon and died in a few days of peritonitis. At autopsy it was found that three or four inches of the rectum in the hollow of the sacrum had sloughed. A small tract extended upward along the sheath of the psoas muscle but there was no distinct cavity at the upper end. No other pathological condition was found although a careful search was made. Dr. Gibbon believes that the lower three or four inches sloughed because of the injury done by the turpentine.

AN UNUSUALLY LARGE PREPATELLAR BURSA.

Dr. John H. Gibbon presented this specimen which before removal was as large as the patient's knee. It was of several years' duration and had never been tapped. The work of the patient had not required the kneeling position. Portions of the bursa are so hard as to suggest the presence of calcareous material but the exact nature has not been determined as the sac has not been opened. A great deal of redundant skin was removed with the bursa. The bursa was dissected away from the patella without rupture and was shown after it had been hardened in formalin solution.

CORRESPONDENCE.

SUTURE OF RUPTURED BICEPS TENDON.

EDITOR ANNALS OF SURGERY:

IN ANNALS OF SURGERY, Vol. XLI., 1905, p. 756, I published a short paper on Rupture of the Tendon of the Biceps Muscle and reported a case of my own. Inasmuch as operation for this injury is very rare (there only having been 4 cases reported up to that date), I think it may interest surgeons to know one further fact in reference to my patient. The operation was done on Dec. 18, 1904. He has just called to see me to state the following facts: He has resumed his athletic life, and among other feats he frequently swings from one trapeze to another over a distance of seven feet. Recently, on two occasions, he missed catching the second trapeze with his left hand and the entire weight of his body, about 120 pounds, with its momentum in flight through the air was borne by the right arm alone, the arm itself being in flexion. No injury or inconvenience of any kind has followed these two accidents. It seems to me, therefore, proof of a very firm union following the overlapping and suture.

WILLIAM W. KEEN.

PHILADELPHIA, December 20, 1905.

RUPTURE OF INTESTINE.

EDITOR ANNALS OF SURGERY:

IN the November number of the ANNALS OF SURGERY Dr. R. P. Campbell furnishes an interesting article upon Rupture of Intestine, in which he enumerates twelve cases of successful operation for this injury, as culled from English and American journals since the year 1894. I would like to call attention to a case of my own, published in the January 23d number of the *New York Medical Record*, for 1904, under the title of "Two Cases of Abdominal Traumatism," and to place on record a second opera-

tion for a similar condition. These two cases constitute the total number upon which I have operated. A man, seventy-four years of age, generally healthy, who had had a reducible inguinal hernia on each side for some years, while lifting a 75-pound cast-iron drum of a cooking-stove into position was seized with an agonizing pain in the belly, which caused him to drop on the floor and lie there writhing. Five hours later he was seen by me. I found a somewhat under-sized spare man of fair muscular development, with large inguinal rings, but no bowel in the scrotum. The abdomen was not found distended, but its walls were hard and the muscles rigid. Tenderness was felt on palpation all over the abdomen but was especially marked in the left lower quadrant, at its upper part. The bowels had moved the day before. P. 80; T. 90°.

Two hours later, after removal to hospital the abdomen was opened in the median line below the navel. Turbid serous fluid escaped; no bowel in inguinal canals. One or two congested and somewhat distended coils of small intestine were now allowed to come out through the wound. Some lymph seen on them, and at one point a small perforation about an eighth of an inch in diameter. This opening was closed by two rows of silk Lembert's sutures, and after sponging off the coils of bowel and returning them, the abdominal wound was united with through and through silkworm gut sutures. An uncomplicated recovery followed.

There was no evidence of the intestine at the point of rupture being in any way weakened by pre-existing disease, so as to predispose to its bursting at that part.

A. B. ATHERTON, M. D.

FREDERICTON, N. B., December 22, 1905.